DOCUMENT RESUME

ED 176 430 EC 120 114

TITLE	Educational Methods for Deaf-Blind and Severely Handicapped Students. Volume II.
INSTITUTION	Texas Education Agency, Austin. Div. of Special Education.
SPONS AGENCY	Bureau of Education for the Handicapped (DHEW/OE), Washington, D.C.
PUB DATE	Apr 79
NOTE	210p.
EDRS PRICE	MF01/PC09 Plus Postage.
DESCRIPTORS	*Auditory Evaluation; *Cognitive Development; *Communication (Thought Transfer); Daily Living Skills; *Deaf Blind; *Motor Development; Prevocational Education; Self Care Skills; *Severely Handicapped

ABSTRACT

The book presents 17 papers originally presented at a 1978 Texas conference on educational methods for deaf-blind and severely handicapped students, covering the areas of motor development, auditory assessment and hearing loss, communication, cognition, prevocational training, and functional living skills. Titles and authors include "An Overview of Normal and Abnormal Motor Functioning -- Implications for Educational Programing" (C. Stone), "Motor Development and Programing for the Deaf Blind, Severely/Profoundly Handicapped Child" (B. Rowe), "Some Aspects of Gross Motor Development" (M. Dodd), "Auditory Assessment" (B. Franklin), "Use of Impedance Measures to Predict Sensori-Neural Hearing Loss" (D. Harris), "Early Evaluation and Diagnosis of Hearing Loss and its Management" (M. Downs), "Auditory Perception and Training" (H. Weiner), "Beginning Communication -- Presymbolic Skills with Multihandicapped Children" (J. Burton), "Language Activities for the Higher-Functioning Deaf-Blind Children" (F. Carlson), "Communication Training for the Deaf-Blind" (J. Cooper), "The Development of Thinking" (H. Furth), "Application of Concepts of Sensorimotor Development to Cognitive Development of Deaf-Blind Children" (C. Robinson), "A Prevocational Perspective Maximizing all Aspects of Adjustment" (F. Simpson), "Prevocational Programming -- Panel Discussion" (Aaron et al), "Teaching Self-Help Skills -- A Developmental Approach" (P. Russell), "The Problems of the Child with Cerebral Palsy and its Relationship to Classroom Learning" (R. Haebig), and "How to Plan and Implement Feeding Programs for Multihandicapped Children" (P. Metcalf). (DLS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED176430

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

EDUCATIONAL METHODS FOR DEAF-BLIND AND SEVERELY HANDICAPPED STUDENTS

VOLUME II

TEXAS EDUCATION AGENCY
DEPARTMENT OF SPECIAL EDUCATION
SPECIAL EDUCATION DEVELOPMENTAL SERVICES
CENTER FOR DEAF-BLIND

201 East Eleventh Street
Austin, Texas 78701
April 1979

Funded by:
U.S. Office of Education
Bureau of Education for the Handicapped
Public Law 91-230, Title VI, Part C

EC120114

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Linda Kemp

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

COMPLIANCE WITH TITLE VI, CIVIL RIGHTS ACT OF 1964; TITLE IX OF THE EDUCATION AMENDMENTS OF 1972; AND THE MODIFIED COURT ORDER, CIVIL ACTION 5281, FEDERAL DISTRICT COURT, EASTERN DISTRICT OF TEXAS, TYLER DIVISION

Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964; Title IX of the Education Amendments of 1972; and with specific requirements of the Modified Court Order, Civil Action No 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

(1) acceptance policies on student transfers from other school districts;

(2) operation of school bus routes or runs on a non-segregated basis;

(3) non-discrimination in extracurricular activities and the use of school facilities;

(4) non-discriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;

(5) enrollment and assignment of students without discrimination on the basis of race, color, national origin, or sex;

(6) non-discriminatory practices relating to the use of a student's first language; and

(7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights Act and/or Title IX of the Education Amendments of 1972 is found, the findings are reported to the Office for Civil Rights, Department of Health, Education and Welfare.

If there is a direct violation of the Court Order in Civil Action No. 5281 that cannot be cleared through negotiation, the sanctions required by the Court Order are applied.

Introduction

The papers contained herein were collected from presentors at the Spring 1978 series of workshops conducted jointly by the Texas Center for Deaf-Blind and the twenty regional education service centers in the state of Texas. The workshops were organized and conducted to respond to the priority inservice needs of educators working with deaf-blind and severely handicapped students.

Recent interest in the field of education for deaf-blind and severely handicapped has led to many advances in educational technology. Personnel working in the field have been justifiably adamant in requesting conferences which provide them with information on the latest and most relevant research; they have demonstrated their committment to the deaf-blind and severely handicapped by their enthusiasm for new ideas and their interest in sharpening their programming skills. This volume is published in hopes of stimulating further interest and, to help maintain the daily committment of those dedicated professionals now serving the severely handicapped.

TEXAS EDUCATION AGENCY

STATE BOARD OF EDUCATION
(State Board for Vocational Education)

MRS. ELIZABETH R. ARMSTRONG, Lake Jackson
JAMES M. BINION, Abilene
JOE KELLY BUTLER, Houston
W. W. CARTER, Amarillo
DON H. COOK, D.D.S., Mesquite
BRYAN CROUCH, Poteet
DR. VIRGINIA CURREY, Arlington
JIMMY L. ELROD, San Antonio
W. H. FETTER, La Marque
WAYNE FREDERICK, Orange
JOSEPH C. GATHE, M.D., Houston
E. R. GREGG, JR., Jacksonville
RUBEN E. HINOJOSA, Mercedes
JIM HOLLINGSWORTH, De Soto
WILLIAM N. KEMP, O.D., Houston
MRS. MARY ANN LEVERIDGE, East Bernard
PAUL MATHEWS, Greenville
REX REDDELL, San Marcos
RICHARD TENIENTE, San Antonio
MRS. LAURA TYNES, Waco
MRS. MARJORY VICKERY, Lewisville
JAMES H. WHITESIDE, Lubbock
WAYNE WINDLE, El Paso

M. L. BROCKETTE, Commissioner of Education
(Executive Officer of the State Board of Education)

L. HARLAN FORD, Deputy Commissioner
for Programs and Personnel Development

ALTON O. BOWEN, Deputy Commissioner
for Administrative Services

J. B. MORGAN, Associate Commissioner,
Policies and Services

Spring 1978 Workshops for Personnel
Serving Deaf-Blind and Severely Handicapped

March 14-15, 1978: Lubbock, Texas

- Classroom Programming for the Multihandicapped Hearing Impaired - Raymond Condon and Tom Valentine
- Gross Motor Development and Programming - Gretchen Stone and Martha Dodd
- Feeding Skills for the Severely/Profoundly Handicapped - Patty Metcalf
- Dressing Skills for the Severely/Profoundly Handicapped - Suzie Tenison

April 13-14, 1978: Corpus Christi, Texas

- Programming for Gross Motor Development - Cindy Stone
- Prevocational Programming - Frank Simpson
- Prevocational Panel - David Aaron, Patricia English, Frank Simpson, Arlein Stein, Gretchen Stone
- Classroom Programming in Communication - Judy Burton, Faith Carlson

April 18-19, 1978: Dallas, Texas

- Diagnosis and Evaluation - Nancy Fieber
- Prevocational and Vocational Education - Roger Hoffman
- Low Vision - Audrey Smith

April 20-21, 1978: Austin, Texas

- The Development of Thinking - Dr. Hans Furth
- Auditory Assessment and Programming - Dr. Barbara Franklin
- Gross Motor Development and Programming for the Deaf-Blind, Severely/Profoundly Handicapped Child - Barbara Rowe

- Auditory Training and Programming - Honey Weiner
- Fine Motor Development, Basic Hand Skills, and Activities for the Deaf-Blind, Severely/Profoundly Handicapped Child - Suzie Tenison

June 5-6, 1978: Austin, Texas

- Feeding Workshop - Rona Alexander, Regi Haebig

Table of Contents

Page

MOTOR DEVELOPMENT

An Overview of Normal and Abnormal Motor Functioning: Implications for Educational Programming - *Cynthia Stone* 3

Motor Development and Programming for the Deaf-Blind, Severely/Profoundly Handicapped Child - *Barbara Rowe*. 23

Some Aspects of Gross Motor Development - *Martha Dodd* 34

AUDITORY ASSESSMENT AND HEARING LOSS

Auditory Assessment - *Barbara Franklin*. 38

Use of Impedance Measures to Predict Sensori-Neural Hearing Loss - *Dean Harris* 52

Early Evaluation and Diagnosis of Hearing Loss and its Management - *Marion Downs*. 61

Auditory Perception and Training - *Honey Weiner* . . 82

COMMUNICATION

Beginning Communication: Presymbolic Skills with Multihandicapped Children - *Judy Young Burton*. 98

Language Activities for the Higher-Functioning Deaf-Blind Children - *Faith Carlson* 101

Communication Training for the Deaf-Blind - *Judy A. Cooper*. 111

COGNITION

The Development of Thinking - *Dr. Hans Furth*. . . . 121

Application of Concepts of Sensorimotor Development to Cognitive Development of Deaf-Blind Children - *Cordelia C. Robinson* 133

Table of Contents (continued)

Page

PREVOCATIONAL

A Prevocational Perspective Maximizing all Aspects of Adjustment - *Frank Simpson* 146

Prevocational Programming - Panel Discussion - *Aaron, English, Simpson, Stein, and Stone* 153

FUNCTIONAL LIVING SKILLS

Teaching Self-Help Skills--A Developmental Approach - *Peggy Russell*. 173

The Problems of the Child with Cerebral Palsy and its Relationship to Classroom Learning - *Regi Haebig* 177

How to Plan and Implement Feeding Programs for Multihandicapped Children - *Patty Metcalf* . . . 182

MOTOR DEVELOPMENT

AN OVERVIEW OF NORMAL AND ABNORMAL MOTOR FUNCTIONING: IMPLICATIONS FOR EDUCATIONAL PROGRAMMING

Cynthia Stone

Classroom teachers working with the severely involved child have come face to face with the problem of educational programming for the child with serious motoric limitations. A child's motor functioning affects other areas of functioning. A child whose oral mechanism is seriously motorically involved may not have the motor patterns necessary for developing oral expressive language. His or her inability to move the limbs independently of each other will make early sensorimotor learning experiences more difficult to occur spontaneously. Thus, the child may be deprived of needed experiences to facilitate his or her cognitive development. Inability to independently move and relate to people may drastically impair social and emotional development. These are examples of problems that may occur with the child whose only disability is severe motor involvement. Compound that involvement with blindness, deafness, or mental deficiency and the above problems multiply.

Motor functioning of children does not just deal with how they are able to maintain their posture against gravity and move in space. It also affects how they are able to respond to their environment in all other areas. Understanding where a child functions motorically and what real limitations the child has motorically will affect how other areas in his or her developmental profile are managed.

In order to understand the rationale behind the motor functioning process, knowledge of normal and abnormal development is necessary. This paper will first discuss the components of normal and abnormal development. It will then give implications for educational programming.

Normal Motor Development: The Process

Motor development is the differentiation of the infant from primitive mass patterns of movement to acquisition of selective movement and strength against gravity as an upright, walking individual with such basic skills as jumping, throwing, and skipping. For motor development to occur normally, there must be harmonious interaction between the internal maturation of the central nervous system and the external interaction of environmental experiences.

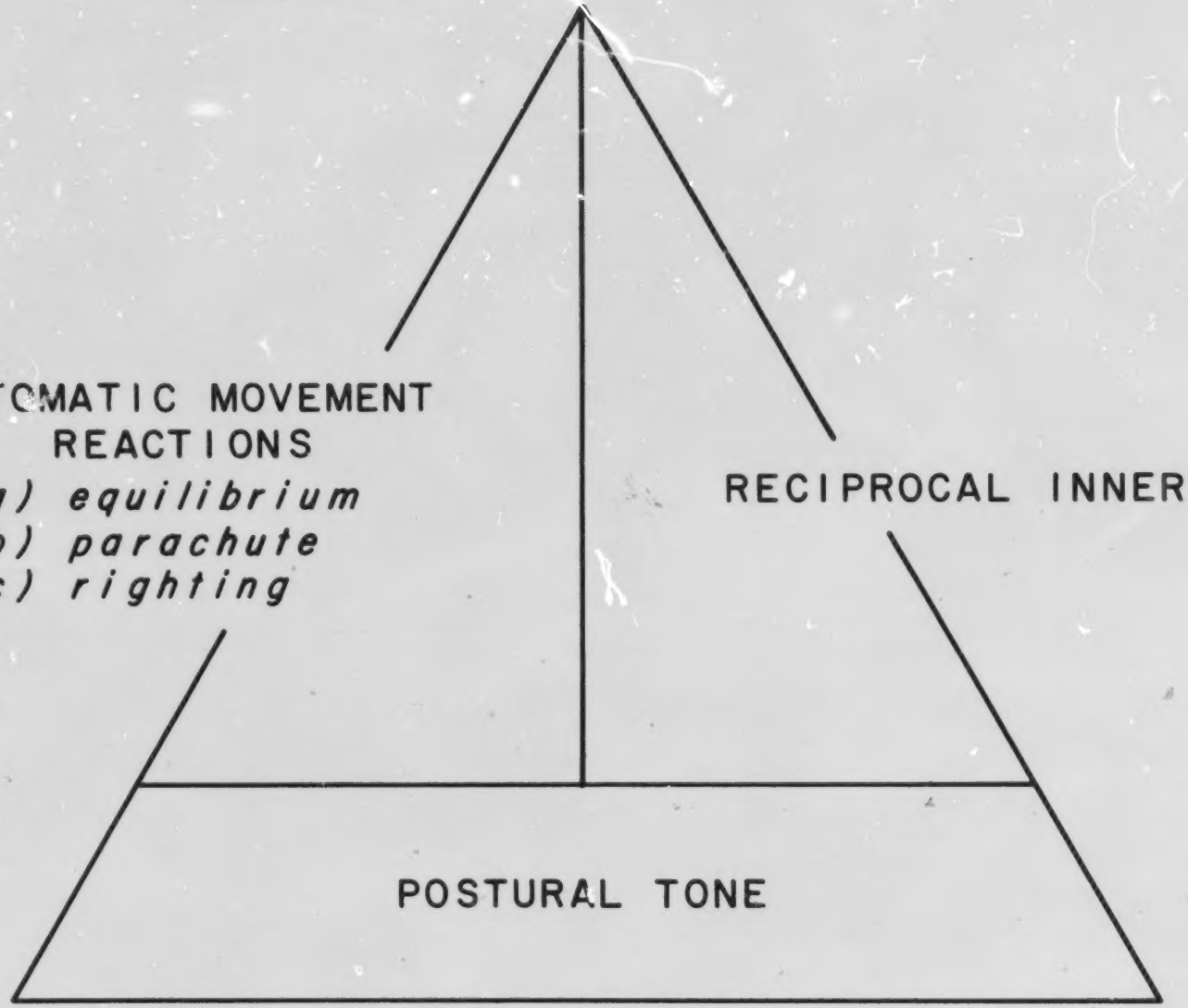
In order to study the components of movement required for any developmental activity, one must have a thorough understanding of the normal postural reflex mechanism (Bobath, 1971), which is the basis for all normal movement patterns. It is matured during the normal developmental process. There are three main components of the normal postural reflex mechanism (NPRM): normal postural tone, normal repertoire of movement patterns, and normal reciprocal innervation (See Figure 1.).

Normal postural tone is the readiness state of the body for movement and the maintenance of a position. Postural tone is constantly changing and adapting to allow the body to move into and maintain positions against gravity. Normal postural tone must therefore be low enough to allow for movement and high enough to maintain a posture.

Normal repertoire of automatic movement patterns are basic patterns of movement which are used to move into a position and maintain a position against gravity. As the movement patterns develop, the infant is able to move out of the primitive total flexion and extension patterns of early babyhood and develop selective movement against gravity. This selective movement is seen with the development of trunk extension against gravity, trunk rotation, selective limb movements, and balance. Selective trunk extension is first seen with the development of head control. Trunk rotation is seen with segmental rolling over from prone to supine. Separation of limb movements is seen with batting at objects in supported sitting and swimming-like movements on the stomach. Early balance is seen when the child is able to reach out for a toy with one arm while on its stomach. Basic automatic movement patterns are all present in crude form by the time the child is able to sit alone when placed (Bobath & Bobath, 1975). From then on, the movement patterns are merely perfected and refined as the child is able to assume more and more difficult positions against gravity. The perfection of these movement patterns is assisted through the development of normal reciprocal innervation, the final component of the NPRM.

Normal reciprocal innervation allows for the smooth coordination of a movement pattern, the ultimate refinement of a movement pattern. A good example is observing the maturation of the hand-to-mouth activities of an infant. When an infant first begins finger feeding, mouth aim is not accurate, and more food is on the infant than in its mouth. With maturation, the aim improves greatly, utensils are introduced, and finally the hand-to-mouth process of eating with utensils becomes mature, coordinated motor behavior.

The three components of the normal postural reflex mechanism--tone, repertoire of automatic movement patterns, and reciprocal innervation--build upon each other. First and foremost there must be normal tone upon which normal automatic movement patterns may occur and subsequently become refined through normal reciprocal innervation.



THE NORMAL POSTURAL REFLEX MECHANISM

Figure 1

The development of the NPRM provides for the five basic components of movement that comprise all motor patterns:

1. Head control
2. Trunk strength and trunk mobility
3. Midline orientation
4. Extension - abduction of limbs
5. Weight shift

The basic five are essential for the acquisition of normal patterns of movement against gravity. They are the component parts of the developmental milestones. A review of the developmental milestones will demonstrate how the five components of movement mature.

Birth

Infants at birth are defenseless against a gravity-based environment. They have two necessary responses for survival: sucking and the ability to turn their heads to the side in prone. They are unable to maintain their heads in midline. They are dominated by random, mass-movement patterns of flexion and extension of the limbs. There is independent, random movement of the fingers and toes.

Figure 2.
The newborn is predominately flexed.

Six Weeks

By six weeks of age, infants demonstrate the ability to hold their heads up in supported sitting and standing. They are also able to bring their heads to midline in supine. Head control is first seen in vertical and supine midline orientation because gravity has the least effect in these two positions. Momentary head lifting is also seen in prone. Early head control shows the beginnings of upper trunk strength. The ability to hold the head in midline in supine and vertical positions demonstrates the beginnings of midline orientation of the body.

Figure 3.
Head control in vertical.

Four Months

Head control in prone is seen on extended-abducted arms. They are able to move their heads independently from the rest of their body. Because of this, their visual field is greatly increased. Hands play in midline with gravity eliminated in supine and supported sitting. This midline play signifies early development of trunk mobility with independent shoulder movement. Trunk mobility is further seen in the infant's ability to roll over from prone to supine. Moving into gravity, he or she is able to separate shoulder girdle from pelvic girdle, one shoulder from the other, and one hip from the other, so that the trunk is moving in four separate quadrants. Extension-abduction of the arms is seen both in prone weight bearing and in rolling over into gravity. The only component of movement not yet present is weight shift, which will emerge as the child gains balance in prone.

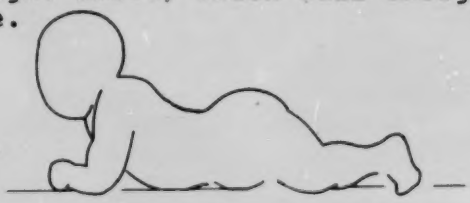


Figure 4.
Head control prone.

Five Months

Five-month-olds have conquered gravity in supine. They are able to lift their heads in supine, culminating head control in all positions. They can rest on one arm and reach for a toy with the other arm while in prone. This demonstrates weight shift and the attainment of balance in prone. They have now acquired all of the components of movement in the prone/supine positions and are now able to move into and out of gravity through segmental rolling.

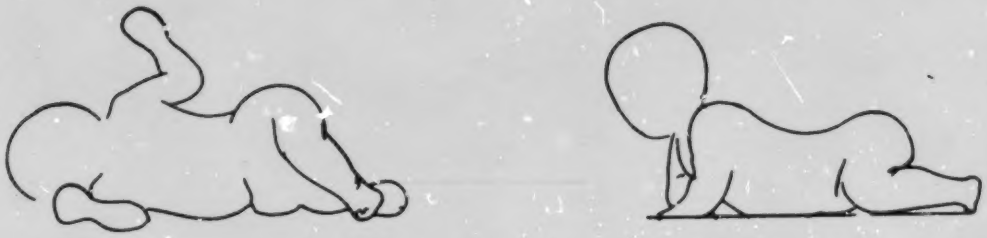


Figure 5. Rolling from supine to prone.

Head control is seen by lifting the head against gravity. Trunk strength and trunk mobility are seen by the separation of the trunk into four quadrants and movement of the body away from gravity through trunk rotation. Midline orientation is seen in the ability to rotate upon themselves. Extension-abduction of the limbs is seen in the separation of one shoulder from the other, one hip from the other, and reaching up and over their bodies. Weight shift is seen with the upper part of their body moving while the lower part of their body remains stationary.

Six Months

Six-month-olds have expanded their horizons in all directions. Their improved mobility, strength, and balance are seen with their ability to sit alone when placed. They use their hands for support in sitting, which again demonstrates the weight-bearing component of extension-abduction of the limbs. Extension-abduction of the lower extremities is seen in supported standing. The ability to sit alone when placed marks the emergence of all movement patterns necessary for standing and walking. From now on these movement patterns will become more refined as they move into more and more difficult positions against gravity.

Figure 6.
Sitting alone when placed.

Seven to Nine Months

The child is now able to rotate up to sit and sit alone with hands free to play through the acquisition of weight shift and trunk control in rotation up to sit. Their hands are now free to play. If they lose balance in sitting, their arms catch the fall in the basic extension-abduction pattern of movement. In Figure 7, notice the good vertical alignment of the head, the separation of the shoulder and pelvic girdle, the extension-abduction of the arms. In Figure 8, notice that weight is evenly distributed between the upper and lower extremities on all fours. Separation of the trunk into four quadrants is seen with creeping. While they are free to move in sitting and all fours, they must hold onto support when placed in standing.

Figure 7. Rotation up to sitting.

Figure 8. On all fours.

Nine Months to Ambulation

These children are motor driven. They conquer gravity one step further by pulling up to standing one leg at a time, standing alone, and finally walking. They are perfecting their ability to move against gravity through improved strength and balance.

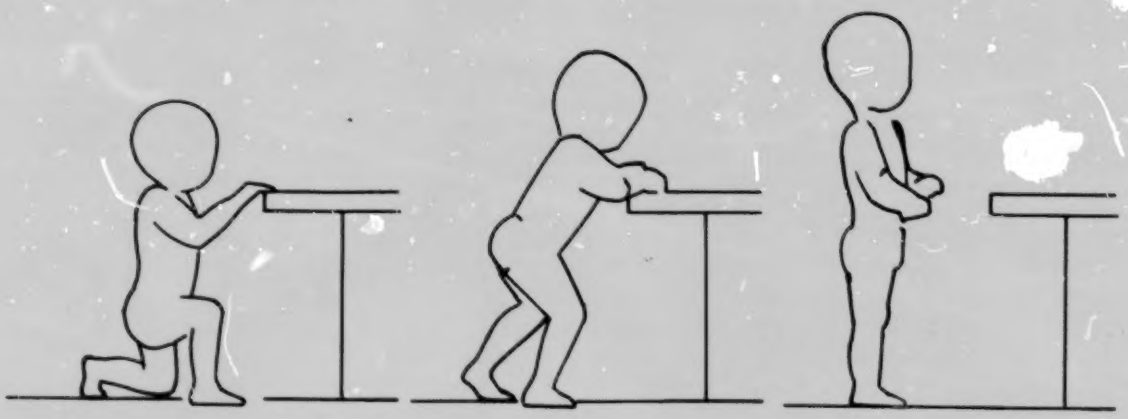


Figure 9.
Pulling up to standing and standing alone.

Reciprocation of the legs in pulling up to standing represents separation of one hip from the other. Children first stand alone with upper extremeties in extension-abduction so that they are ready to catch themselves should they fall.

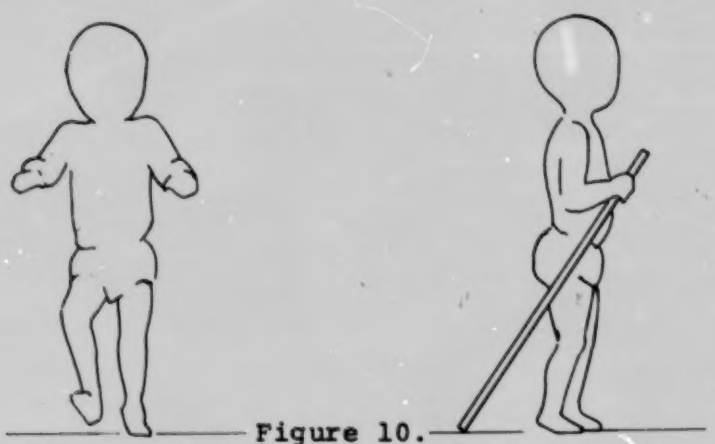


Figure 10.
High guard walking, no guard walking.

Early ambulation is seen with the arms held high and toe walking. With improved balance, the gait becomes flat footed and the child is able to pull a toy.

Conclusion

An observable result of central nervous system maturation is the acquisition of developmental milestones. To truly understand motor maturation, the developmental milestones need to be observed in their component form, as not all children perform each developmental milestone, but all normal children do acquire normal components of movement (Bobath & Bobath, 1975).

Children have motor personalities which are both intrinsic and extrinsic to the environment. There are extensor children, who prefer not to creep on all fours. They are happiest in standing, are often in baby walkers and may move directly from stomach scooting to pulling up to standing, cruising, and walking. There are also children who never crawl or creep due to external environmental conditions. This last example is often observed in European countries where carpeting of floors is uncommon. These children still develop the components of movement required for crawling and follow the normal course of development.

One important outcome in the normal developmental process is that normal youngsters will have achieved upright ambulation status by the fifteenth month. They are vertical locomotors, they have a vertical orientation to their environments, and all of their components of movement are intact. There is little fear of development of contractures and deformities due to too much or too little movement or improper positioning, as the child is free to move in all planes and is not stuck in one habitual movement pattern.

Abnormal Motor Development: The Process

In cerebral palsy, damage to the central nervous system interferes with the orderly neuromotor development of the normal postural reflex mechanism (Bobath, 1974). A retardation or arrest in motor development is generally observed with behavioral characteristics of poor head control, lack of trunk rotation, and poor balance.

Neuromotor characteristics are seen in the form of abnormal postural tone; retention of primitive, infantile movement patterns; presence of pathological reflex activity; and a disturbance in reciprocal innervation. Cerebral palsied children interact with their environments with resulting abnormal patterns of movement. Without trunk rotation they are unable to move easily against gravity. If they are able to sit up they usually do so by pushing back on their haunches. Pulling to stand is cumbersome, as their entire bodies are pulling down into gravity. Their repertoires of movement patterns are very limited, and because of this they often develop contractures and deformities from staying in the same position or from always moving the same way. Secondary problems will often prevent them from achieveing higher developmental levels. Cerebral palsied children are able to respond to their environments only through their abnormal patterns. If they are to achieve more independence, their abnormal patterns of movement must be tackled.

Cerebral Palsy

> The result of a lesion or maldevelopment of the brain, nonprogressive in character and existing from earliest childhood. The motor deficit finds expression in abnormal patterns of posture and movement, in association with an abnormal postural tone. The lesion which is present in the brain when it is still immature interferes with the normal motor development of the child (Bobath, 1974).

Cerebral palsy is classified as to the type of dominating postural tone and the distribution of postural tone.

Type of Dominating Postural Tone

Spasticity: Spastic children have great difficulty in moving against gravity. If they do move, it is often in total flexion and extension patterns, as presence of spasticity is preventing selective trunk rotation.

Athetosis: Athetoid children demonstrate fluctuating postural tone. They may often demonstrate wide uncontrollable rotary movements. Their abnormal postural tone causes difficulty in maintaining postural control against gravity.

Hypotonia: Hypotonic children demonstrate abnormally low postural tone. This type of tone is also termed flaccidity. Hypotonic children are not as common as spastic and athetoid children.

Mixed Tone: Mixed children demonstrate both athetoid and spastic components. Depending on the dominant tone, they may be termed an athetoid with spasticity or a spastic with athetosis.

Rigidity: Rigid children are severely involved motorically. Their tone is so high in all movement patterns that very little spontaneous behavior is noted, if any.

Distribution of Tone

Hemiplegia: One side of the body is affected. These children usually show spasticity. Usually sensation is impaired on the affected side. The child generally functions only with the good side of its body.

Paraplegia: Only the legs are involved. This is a very rare condition.

Diplegia: The lower extremities are more involved than the upper extremities. Diplegic children are generally spastic. They use their arms in many types of pulling activities to compensate for their involved legs. This causes increased spasticity in the legs. They often sit with the arms free to play to compensate for contractures in the legs. The main problem these children have is the development of independent ambulation.

Quadriplegia: The entire body is involved. There is both athetoid quadriplegia and spastic quadriplegia.

Athetoid Quadriplegia: There is more involvement in the arms than in the legs. They have mass extensor patterns of movement causing much difficulty in bringing the hands to midline for functional activity. They have poor postural stability and demonstrate jerky, uncoordinated movements due to fluctuating postural tone. These children tend to become asymmetrical with age and may develop scoliosis, contractures, and other deformities.

Spastic Quadriplegia: One side is usually more involved, causing an asymmetry of positioning. Arms may not come to midline because of severe spasticity. Long periods of wheelchair sitting produce contractures in the upper and lower extremities so that the child is unable to straighten its body when lying flat.

The Hypotonic Child: These children are very passive and demonstrate little outward response to their environments. They may also show little or no response to pain. Because of their low postural tone, they are unable to right themselves against gravity. They demonstrate primitive frogged legs in both supine and prone and may even be unable to turn their heads in prone. Their low tone often produces breathing problems. With age, they may develop asymmetrical extensor tone. All hypotonic children are quadriplegics.

Pathological Tonic Reflex Activity (Bobath, 1974; Bobath & Bobath, 1975)

This is abnormal reflex activity released due to a lesion affecting higher motor centers. In the cerebral palsied child, these pathological reflexes are never seen in isolation. They work in combination with abnormal postural tone and primitive

movement patterns to produce the abnormal patterns of movement seen in children with cerebral palsy. In evaluating the cerebral palsied child, recognition of specific pathological reflexes is insufficient. The isolated reflexes are not treated. Treatment is concerned with reducing abnormal tone and changing abnormal patterns of movement. The pathological reflexes are listed separately only to show the affect they may have on individual patterns of movement.

Developmental Delay

General developmental delay is quite different from cerebral palsy. The generally developmentally delayed child is usually globally delayed in all areas of development. This is especially seen in the Down's Syndrome infant and in the congenitally blind infant. These children demonstrate an immature postural reflex mechanism and the persistence of primitive movement patterns as lack of weight bearing when lowered to standing and the persistence of a startle response. Because they do not show pathological motor patterns, a general developmental program to encourage head control, trunk rotation, and balance reactions included in their educational plan will be beneficial. A pediatric therapist in the teaching team will offer added information regarding each child's motor strengths and weaknesses and will be able to assist the teacher in working with the child motorically.

The Role of the Pediatric Therapist

The pediatric therapist is an essential ancillary person in educational programs serving the severely and profoundly handicapped. The therapist should provide the following:

1. Inservice training to the educational staff on normal and abnormal development, and basic principles of handling the nonambulatory child.

2. Individual training with each teacher in handling techniques and the purpose of the individual motor program for specific nonambulatory children. Training on how to perform motor exercises for each individual child.

3. Performance of the motor assessment on each individual child. The therapist and teacher together will perform the components of the assessment that require behavioral observation.

4. Development of a motor notebook on each individual child where specific handling techniques and specific motor exercises are discussed and illustrated.

5. Long- and short-term motor goals on each individual child.

6. Be a member of the teaching team in planning the child's total program so that motor goals may be incorporated into educational activities and a child's motor difficulties are considered in his or her educational plan.

7. Availability on a regular basis to re-evaluate the motor program with the teacher, make revisions and work with the teacher and the child on his or her motor program.

To aid in educational programming, the motor assessment should provide the following criteria:

1. Provide multiple baseline information. Relate the child's motor functioning to functioning in other areas of development.

2. Evaluate CNS maturational level through standardized testing for specific evoked responses. Relate CNS functioning to observed patterns of movement.

3. Describe the physical abilities and limitations of the individual child.

4. Discuss implications for the home and classroom environment which include use of adaptive equipment and handling procedures to prevent contractures and deformities and encourage development of motor skills.

5. Discuss implications for the educational plan which are: how to compensate for motor difficulties in the curriculum plan; how to make use of motor abilities to encourage the development of cognition, language, adaptive behavior, and ADL skills; how to equalize the arousal level to gain maximum attention.

6. Determine ancillary personal needs: cognitive skills of the child should always determine proper placement; a thorough motor assessment will assist in determining what ancillary services are needed in his or educational program.

Measurement of Motor Skills

Improvement in motor skills is measured in the following areas:

1. In profoundly involved children who have a paucity of movement against gravity, symmetrical positioning is measured with and without adaptive equipment. The amount of time a child is able to stay in a symmetrical position using adaptive equipment should increase if abnormal tone is effectively being lowered through proper handling, positioning, and motor exercise.

2. Passive measurement is made to see if contractures and body asymmetries have been reduced or at least maintained. Some children are so severely contracted that improvement in body symmetry may be impossible.

3. Improvement of motor functioning is also measured during functional activities in the classroom. The amount of accurate responses a child makes with the head pointer would indicate whether head control is improving. The word accurate is used because the teacher is measuring motor skill, not cognitive skill. The importance of measured motor improvement through function cannot be emphasized enough.

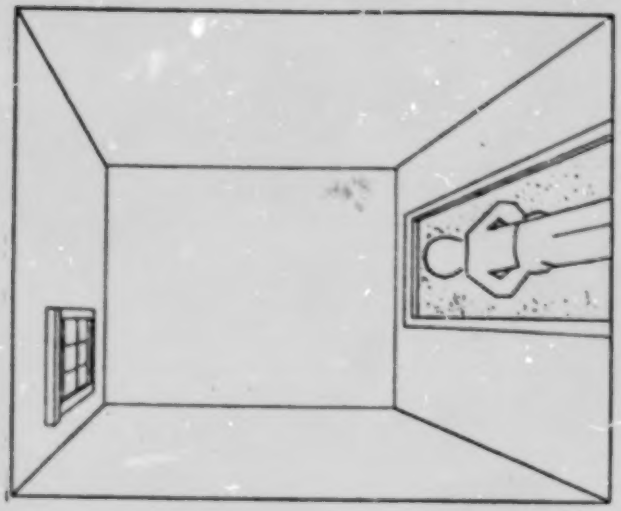
Adaptive Equipment

The use of adaptive equipment is an extremely important adjunct to a child's educational programming. Nonambulatory children need position changes for the following reasons:

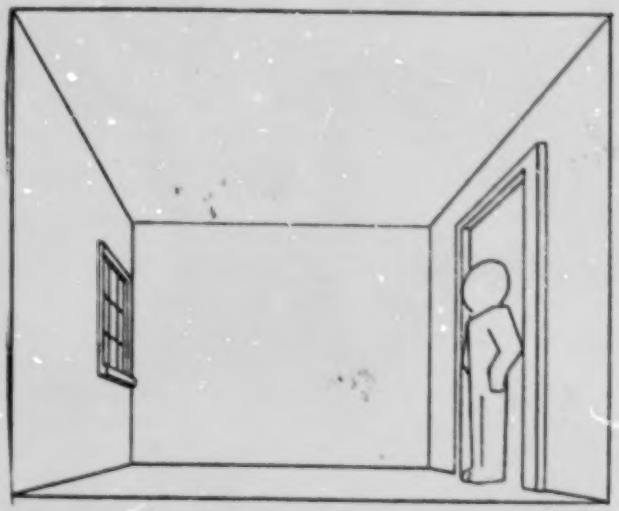
1. To give them various visual perspectives of their environment. Figure 11 denotes how a child views a room with a four foot person standing in the doorway. These perspectives are drawn with the child's head in the midline position. With asymmetrical head positioning that many of severely involved children demonstrate, the visual perspectives would be even more disturbed. The supine position is not only disturbing visually, it is also threatening psychologically. It reinforces the fact that the child is completely dependent on an outside person to help him or her. It is important to see how objects are viewed in the various positions also. With a child in supine, a normal mobile might only appear as one-dimensional lines, circles, and squares.

2. To prevent contractures and deformities. By breaking up the habitual often asymmetrical posturing of the child, further contractures and deformities may be prevented, and the child may achieve more symmetry.

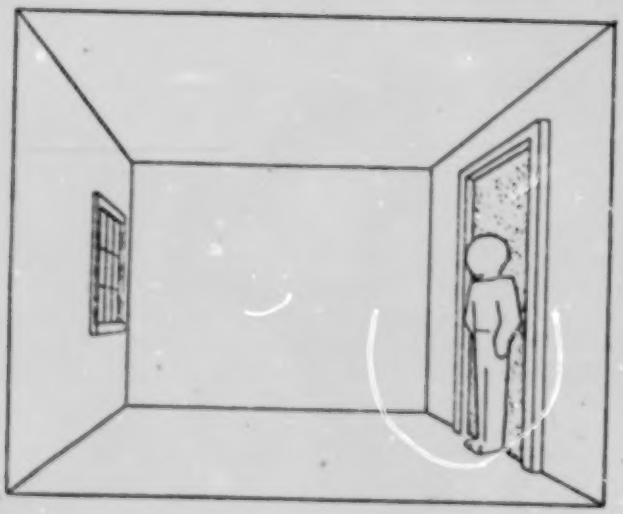
Figure 11.
Child's view of a person standing in the doorway of a room.



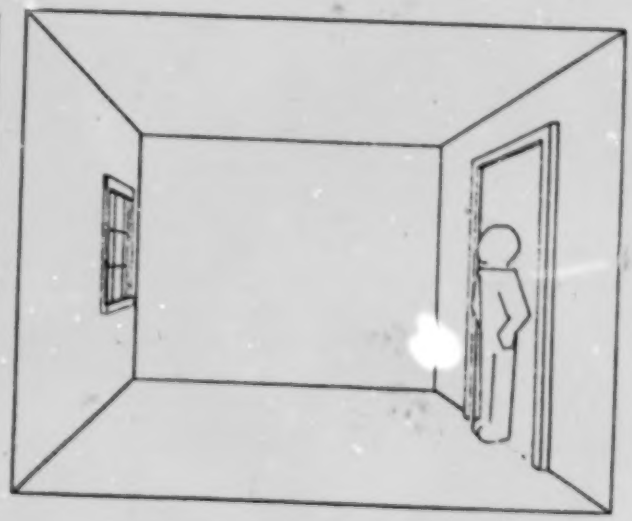
SUPINE



PRONE



SITTING



STANDING

Development of secondary contractures and deformities can prevent the child from acquiring his or her maximum potential. Another important point to remember in positioning is that the child should never be left in the same position for more than 60 minutes. We as adults never stay in the same position for longer than 20 minutes, and even while we are in one position we have the ability to shift our weight around. The severely involved child is unable to do this.

3. To provide positions that are feasible both from an educational viewpoint and a physical viewpoint. The position used for a specific educational activity needs to be carefully thought out for each child individually. The child's postural control needs to be carefully considered. While prone positioning may be ideal for a specific child to work on head control, it would be disastrous for working on maintaining visual attention, as the child is too busy concentrating on holding the head up in space.

Figures 12 and 13 demonstrate how adaptive equipment may be used both educationally and physically.

Conclusion

Motor programming for the multiply handicapped child must not merely follow a motor development curriculum. The motor impairments of the child are individualized, and his or her motor programming must also be individualized. One must take into account that normal infants assume all positions in space soon after birth. At first they are supported in these positions due to lack of sufficient postural control against gravity. The handicapped child too should be given the opportunity to have a myriad of visual and kinesthetic experiences. Normal infants are able to completely orient themselves vertically by 15 months through acquiring ambulation status. The handicapped child may also have this vertical orientation through the use of adaptive equipment. How a child is physically handled in the classroom as well as the classroom environment will affect the motor performance of the child. The pediatric therapist is able to provide instruction to the teacher on the individual motor needs of the child. There must be ongoing communication between the ancillary personnel, the parents, the educators, and the child, so that everyone involved is working toward a common goal.

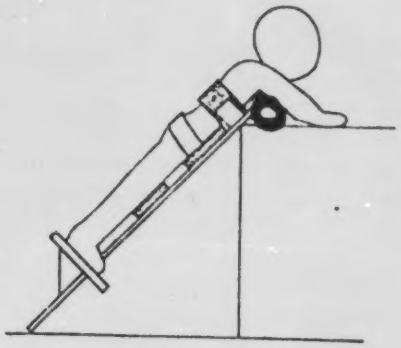
Figure 12.
The use of adaptive equipment to improve positioning and aid in educational programming.

Long sitting--physically good, educationally bad; the hands are not free for function

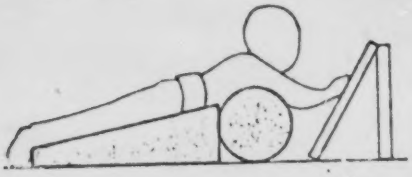
W sitting--physically bad, educationally good; the hands are free for function

Adapted chair sitting--physically good, educationally good; the hands are free for function

Spastic quadriplegia, asymmetrical posturing reinforced by supine position--child has visual field of supine position much like looking through a fish eye lens.

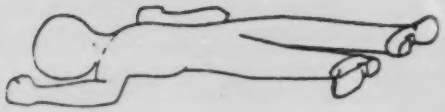


Prone board attains body symmetry. Child has visual field in near vertical position.



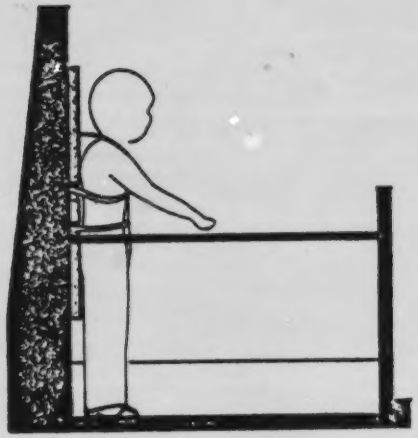
Prone over a wedge and a bolster attains body symmetry. Child has visual field in prone position.

Figure 13. Adaptive equipment.

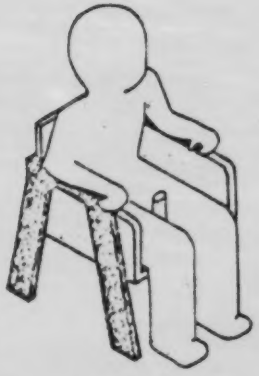


Unstructured positioning, supine

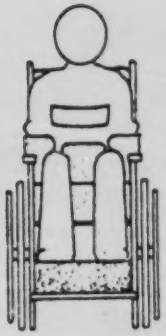
Unsupported sitting



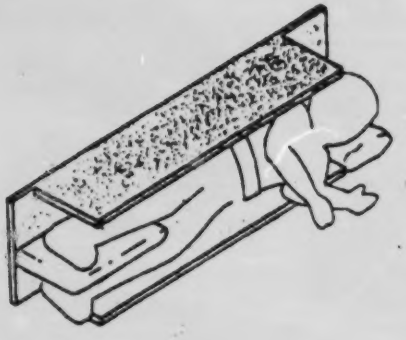
An alternative to positioning: the standing table



Supported sitting in a specially fitted chair



Supported wheelchair positioning



The sidelyer

Definitions

Supine: lying on back

Prone: lying on stomach

Upper extremities: arms

Lower extremities: legs

Shoulder girdle: designated area of the trunk which includes the shoulder blades, upper trunk, and shoulders.

Pelvic girdle: designated area of the trunk which includes pelvis, lower trunk, and hips.

Flexion: bending of a joint

Extension: straightening of a joint

Abduction: position away from the midline of the body

References

Bobath, B. Abnormal postural reflex activity caused by brain lesions. London: William Heinemann Medical Books LTD, 1971.

Bobath, B., & Bobath, K. Motor development in the different types of cerebral palsy. London: William Heinemann Medical Books LTD, 1975.

Bobath, K. The motor deficit in patients with cerebral palsy. London: William Heinemann Medical Books LTD, 1974.

Suggested Readings

Milani-Comparetti, A., & Gidoni, E. A. Routine developmental examination in normal and retarded children. Developmental Medicine and Child Neurology, 1967, 9.

Stone, C. Motor skills. In N. Haring (Ed.), Developing effective individualized education programs for severely handicapped children and youth. Columbus, Oh.: Special Press, 1977.

Cynthia Stone
4050 Williamsburg Road
Dallas, Texas 75220

MOTOR DEVELOPMENT AND PROGRAMMING FOR THE DEAF-BLIND, SEVERELY/PROFOUNDLY HANDICAPPED CHILD

Barbara Rowe

At first glance, the problems of educational programming for physically handicapped children with severe sensory and/or cognitive limitations can seem overwhelming. In particular, if the child has the motor disabilities collectively referred to as "cerebral palsy," teachers and parents alike may feel totally confounded by the management problems the child presents. The dilemma is all the more frustrating when teacher and parent intuitively feel the child is aware, has potential, and could develop if the right approaches could be used.

Such problems warrant the full energies of a team of concerned "specialists"; however, more often than not, services are limited by geography, finances, or availability of personnel. It is common that the educator, in such situations, becomes the specialist who can offer support and guidance for the parents and who, together with the parents, works out appropriate management programs for the handicapped child. When present, a physical or occupational therapist can and should provide support for those management problems arising from physical disabilities. It is hoped that the following information will summarize the disabilities, show how a therapist might approach them, and indicate the therapeutic measures that can be incorporated into classroom activities or home programs. Teachers and parents alike are encouraged to adopt the positive mental set that these physical problems can indeed be solved or at least ameliorated once recognized and understood.

The motor handicaps most often seen should be thought of as "developmental disabilities," or disruption, distortion, or absence of the normal process of sensorimotor development which occurs in infants and toddlers without neurological deficit or brain damage. Such development is a very complex, but systematic and sequential emergence of motor patterns and abilities, made possible by the gradual maturation of the central nervous system, coupled with the infant's interaction with his or her environment. It must be emphasized that normal motor development follows the same general principles of learning and maturation seen in cognitive growth, where sensory input provokes central nervous system processing or integration and leads to some form of output, most often motor. The disturbance in cerebral palsy or developmental disabilities affects the entire arc and should be considered a sensory, integrative, and motor disability.

A very brief review of normal development will set a stage for discussion of programming for these disabilities when they appear in profoundly handicapped children. For more detailed discussions, the references included at the end of this paper are highly recommended.

In the nonhandicapped infant, motor development proceeds according to several general principles:

1. Development is sequential, with each new acquisition based on behaviors previously acquired.

2. Development is "cephalocaudal," or "head-to-toe" in nature, with head and trunk control, for example, preceding other movement abilities.

3. Development starts proximally (close to the body axis) and moves distally (outward or away from the body axis).

4. Development starts with gross, generalized, or total patterns and gradually becomes refined, specific, or "disassociated" (broken into partial patterns or discrete movements) (Connor, Williamson, & Siepp, 1976).

What permits this orderly progression is a gradual emergence of successively more complex central nervous system control, elicited by the interplay of the infant's innate reflexes and his or her active interaction with the environment. The sensory information involved is tactile (received through the skin), proprioceptive (received through the muscles, tendons, ligaments, and joints), kinesthetic (received through the proprioceptive system but responding to movement), vestibular (received through the labyrinths of the inner ear), visual, auditory, and to a lesser extent, olfactory and gustatory. The various sensory inputs are integrated at different levels of the central nervous system, with each successively higher level exerting a modifying influence on the levels below. For the most part this influence is thought to be inhibitory, i.e., blocking or preventing expression of responses from lower levels. The outputs of this sensory integration are the infant's motor abilities. The central nervous system hierarchy and the reflexes involved at each stage are well described elsewhere and are beyond the scope of this discussion. (Two especially good references for understanding these reflexes and their role in development are Fiorentino's Reflex Testing Methods for Evaluating CNS Development and Bobath's chapter on cerebral palsy in Physical Therapy Services in the Developmental Disabilities.

For introductory purposes, however, the reflexes with which we will be most concerned, and their suspected levels of integration, are as follows:

1. At the spinal cord level of integration:
   flexor withdrawal
   extensor thrust
   crossed extension

2. At the brainstem level of integration:
   asymmetrical tonic neck reflex
   symmetrical tonic neck reflex
   tonic labyrinthine reflex

3. At the midbrain level of integration:
   neck righting
   labyrinthine righting
   body righting on the body

4. At the cortical level of integration:
   equilibrium reactions in prone
   equilibrium reactions in supine
   equilibrium reactions in sitting (Fiorentino, 1973)

It is often easiest to discuss the motor development which arises from the interaction of these reflexes and the child's exploration of his or her environment in terms of the major objectives which are accomplished at various stages within the infant's first 12 months. The process has been well analyzed and described in the references cited at the end of this paper; the following discussion is this writer's synthesis of material found specifically in Bobath & Bobath, 1972; Connor et al., 1976; and Fiorentino, 1972 and 1973. The Connor et al. text is especially recommended for teachers and parents as an excellent, clear description of normal development, developmental disabilities, and interventions.

In the first four months of normal development, the infant's primary goal is to gain head control and an orientation of the head in relation to space. Reflexive activity gives way in the first month or two to purposeful activity, and the spinal level reflexes disappear rapidly. The baby in backlying is initially flexed and quite helpless, but quickly learns head turning to a variety of stimuli and exercises neck righting to bring the body in line with the head. When placed in prone (front-lying), the baby attempts to raise its head in order to attend to various stimuli; this elicits neck extension, activates proprioceptive and kinesthetic receptors in the neck and thoracic spine, and extension against gravity begins. Labyrinthine righting acting on the head reinforces this pattern, and head control emerges, to be refined over the next few months in various positions.

During this time very fleeting evidence of the influence of some other reflexes (thought to represent mediation at a brainstem level) appear as intermittent postures or subtle influences on a baby's movements. These include the rather classically demonstrated asymmetrical tonic neck reflex (ATNR) or "fencer's" posture, in which, if the head is turned to one side, the arm on that side extends and the opposite arm flexes. Even more subtle changes may occur in the legs. In normal development, these effects never dominate the infant's movement patterns; in abnormal development, they often do.

From four to six months the infant continues establishing head control against gravity in prone (on elbows or increasingly on extended arms) and begins to transfer its increased muscle tone in extension to its trunk. This becomes apparent in improved alignment of the body when the baby is held at one's shoulder or when placed in sitting, and by six months the infant has the strength, although not the balance, to sit in a reasonably erect posture.

During this period also the neck righting reflex has been teaching the infant an early rolling technique, as noted above, usually prompted by visual or auditory attention to an attractive stimulus. Thus, auditory and visual input becomes coupled with vestibular, proprioceptive, and kinesthetic input to facilitate the learned motor behavior of rolling. This process is repeated with variations as each new motor behavior emerges.

From six to eight months the major goal of normal motor development becomes establishing sitting balance with arm support (made possible by the appearance of protective extensor thrust responses in the arms and by disappearance of the Moro, or startle response, present upon presentation of sudden movement or sound stimuli from birth until about this stage). At the same time, continued practice on extension in prone has brought the infant into prone pivoting positions which encourage asymmetrical upper extremity activity as the infant propels him or herself circularly or supports on one arm while reaching with the other for a desired object. Occasionally the infant couples this pivoting with reciprocal leg kicks and either symmetrical or reciprocal arm pushes, and a primitive belly crawling begins to appear, usually directed backwards. Considerable practice in this new skill occurs, and in the process, the infant often pushes backward sufficiently to bring him or herself to sitting between his or her legs.

In addition, during this period the early "log rolling" of the infant, initiated by neck righting, gives way to segmental rolling as the body-righting-on-the-body reaction appears. Contributing to this pattern is the accentuation of asymmetrical arm support in prone; together these abilities add a rotation component to the baby's earlier patterns, which included primarily flexion and extension motions. Toward the end of this period the

infant's trunk extension is usually strong enough to permit him or her to balance in sitting, and the newly acquired rotation supports subsequent efforts to free his or her hands for exploring objects. Equilibrium reactions have appeared in prone and supine to support the motor efforts of the period, but sitting balance remains easily threatened.

From eight to 12 months the infant is learning the components of standing and walking "from the ground up." Asymmetry and reciprocal patterns dominate the limbs, while rotation dominates trunk movement, and creeping on all fours emerges from the rocking practice the baby has previously experienced in the belly crawling or "commando crawling" position. Mobility is dramatically increased. Increased rotation also allows the baby to move readily from prone to sitting and vice versa. An urge to explore greater heights can be seen when the child, on all fours, approaches furniture and pulls to standing, which becomes a favorite activity (often previously present in accidental fashion if the baby has used playpen or crib bars to rise sitting). With practice in the standing position the infant begins slowly to discover its balance and amid many tumbles achieves upright stability against gravity. This translates also into improved equilibrium reactions in sitting, and fully developed protective responses are present, forward, sideward, and rearward in sitting. Within the next few months the infant, now rightfully earning promotion to the "toddler" category, will combine elements of trunk extension, limb flexion, equilibrium reactions, asymmetrical and reciprocal movements, and rotation into its first tentative steps, which he or she will spend the next several years refining and modifying. For all intents and purposes, however, all the raw material required for more sophisticated motor abilities is present in the developments of the first 12 months.

In the severely and profoundly handicapped or the sensory handicapped child, two possible disruptions to this normal developmental process are common. In the first instance damage to the central nervous system prenatally, at birth, or postnatally often disturbs or destroys normal functioning in the higher brain center controlling movement, especially the cerebral cortex. Without the mediating effects of these centers, lower centers predominate, and more automatic movement patterns appear which are primitive, stereotyped, and often abnormal; the muscle tone which appears within these movements is often either too high (hypertonic) or too low (hypotonic). The children who present this picture are generally called "cerebral palsied" (Bobath, 1972; Connor, et al., 1976).

The second major disruption of the normal patterns can be seen in children who are generally described as developmentally delayed or retarded, in that no motor pathology is observed, simply a marked delay in or failure of normal development. These children are in many ways easier to work with because of the absence of motor pathology and because of their responsiveness

to carefully planned incremental learning experiences with a sensory base. It is the first group, the motor handicapped child, that will be discussed below.

It is important to re-emphasize at this point the sensory-motor aspects of this handicapping condition. Because of the disruption in the central nervous system, perception of sensory information is distorted on the input side of the learning model as well as motor patterns on the output. It is quite reasonable to hypothesize that the integrative component is likewise disturbed. Regardless, one must consider that what the child senses is normal to that child. If he or she feels the proprioceptive and kinesthetic feedback from movements dictated by an uncontrolled asymmetrical tonic neck reflex, that is normal for him or her. If he or she always sees the world from flat on the back on a mat, that is normal for him or her, and that becomes his or her frame of reference on the world. In order to bring such a child into more productive developmental stages, our goals must be to provide both sensory input and movement experiences which match those found in normal development. In terms of the neuro-developmental treatment approaches favored by therapists working with these children, that involves inhibiting or reducing abnormal muscle tone or movements and concomitantly facilitating or making easier for the child more normal movement patterns (Bobath, 1972). Careful handling and positioning of the child throughout the day in all his or her activities is the treatment recommended for teachers and parents, in addition to specific therapies. For our purposes, positioning and handling become the teacher's best tools in programming for these children. (In this regard, the single best resource is a book entitled Handling the Young Cerebral Palsied Child at Home, by Nancie Finnie. It describes problems encountered and solutions which have worked in home management programs, consistent with the general principles noted above. It is an excellent, invaluable reference tool for teachers, parents, and therapist. Complete information is contained in the reference section.)

Children who have the collection of symptoms called "cerebral palsy" generally show one of the following predominant patterns:

1. Spasticity--Increased muscle tone dominates, which is often expressed in a few stereotyped movement patterns which are dictated by abnormal reflex activity. Spasticity can appear in one limb (monoplegia), both lower extremities (diplegia), upper and lower extremities on the same side (hemiplegia), or in all four limbs (quadriplegia). The amount of spasticity is usually described as mild, moderate, or severe.

2. Athetosis--Hypotonia, or low muscle tone, is frequently seen, but it often alternates or fluctuates with periods of normal or increased muscle tone; movements are frequent, uncontrolled, and poorly graded, and stability is often difficult to achieve even momentarily. Athetosis is most often found in both the trunk and all four limbs, but the severity of involvement may vary within this distribution.

Although elements of the patterns are often combined, for explanatory purposes they will be considered as separate clinical entities.

Programming for the child with spasticity usually must emphasize positioning to prevent deformities or contractures (shortening of muscle tendons from habitual positioning or continuous spastic muscular contractions in the same direction) from occurring. At the same time one must encourage the emergence of carefully assisted normal movement patterns. For young children with spastic quadriplegia, for example, programming would emphasize:

1. As much carefully controlled movement experience as possible, encouraging rotation in the trunk, movement of head or limbs alone without total body involvement, and avoidance of postures which provoke reflex-initiated spasms. In general, positions which support this effort would include the following:

2. Avoiding supine unless neck or hip flexion is provided to break up a tendency toward total extension.

3. Encouraging prone with the arms brought forward over a roll or bolster to permit neck extension efforts and reduce a tendency toward total flexion in this position.

4. Keeping the legs (which frequently show "abductor spasticity" or pulling together in combination with extension and turning inward) separated or "abducted," turned outward and partially flexed, particularly at the ankles; this will be applicable in supine, prone, and sitting as well.

5. Sidelying to gain alignment and early eye-hand contact as the hands fall naturally into midline.

6. Supported sitting in positions which break up total extension or flexion patterns and encourage active head control, as in sitting over a bolster seat with legs abducted and trunk partially supported.

These preferred positions must be considered by the teacher when planning classroom activities, particularly cognitive, fine-motor, or language activities in which the child might be expected to have to expend considerable effort. A therapist can assist in determining which position(s) can best enhance a child's ability for a given activity, as well as support specific therapy treatment goals.

Programming for the child with spasticity in a hemiplegic pattern is often more difficult because the child has frequently developed early mobility based on the normal motor patterns of the unaffected side. Unfortunately, because of a phenomenon called "associated reactions," activity of the unaffected limbs causes an increase in the spasticity or muscle tone in the unaffected limbs, so that the more active a child becomes, the more abnormal become his or her patterns. Further, there is often considerable sensory disturbance on the affected side, so that the entire side may be neglected or ignored in favor of the more normal sensations of the unaffected side. The original asymmetries these children present are thus increased as they grow and develop. Classroom programming must emphasize:

1. Normalizing sensory input to the affected side.

2. Weightbearing and other normal motor activities in symmetrical patterns, emphasizing the affected side.

3. Avoidance of asymmetries.

4. Preventive positioning of the affected limbs to minimize neglect of those extremities or the development of joint restrictions.

Programming for the athetoid child requires a very different emphasis, as the problems are ones of reducing mobility and encouraging stability. In general in classroom activities this will require:

1. Carefully controlled positioning and handling of children to restrict random movements or limit their range.

2. Carefully graded movement or presentation of sensory input to minimize hyper-responsiveness and concomitant motor hyper-reactivity.

3. Positioning in which gravity has a chance to exert a downward pull against which the child's muscles can respond and in which the child's body weight provides some passive stability over the joints of trunk, hips, knees, and shoulders, as in semisupported sitting, all fours, kneeling, and standing.

4. Sensory stimulation and positioning or movement which encourages increased muscle tone first in the trunk and then in the extremities, in symmetrical patterns.

Obviously these general recommendations need to be carefully analyzed for each given child, and the importance of the team contributions to programming becomes most apparent. In the absence of specialized input, however, these guidelines and a knowledge of normal motor development will provide a teacher with a starting point. Study of the references cited below will prove invaluable in answering questions regarding positions and activities to use with the physically handicapped child, as such questions inevitably arise.

When the physically handicapped child has major sensory impairments as well, additional questions or priorities in programming arise. As mentioned above, visual and auditory inputs account for much of the stimulation in early development which provokes motor responses. For example, it is the optical righting reflex which reinforces an infant's attempts to lift its head. If the visual system is significantly disturbed, auditory localization and fixation may substitute for the visual stimulus, and labyrinthine righting reflexes will assume priority in further development of head control. The visually handicapped child can be helped to work on head control in supported sitting with control at the shoulders, as this also activates labyrinthine righting. Auditory reinforcement can be an added stimulus.

If the child is visually alert but hearing handicapped and physically handicapped, other problems emerge. The child may be attentive to and curious about classroom happenings and may make use of abnormal patterns in seeking out enticing objects. If auditory training in locating sound sources is part of the child's program and movement responses are elicited, these will often serve to reinforce abnormal patterns. It becomes the teacher's responsibility to plan response modes or adaptations which allow the child success but avoid abnormal motor activity. The temptation is to add "within reason" or "where possible" to this advice, as these are the areas where priorities clash most clearly. Parents, teachers, and therpists must collectively decide where their priorities (and those of the child) lie, and if cognitive growth based on sensory experience is most critical, some compromise of motor abilities or patterns may be inevitable. If, however, an inventive team can plan nondetrimental motor response strategies for use in classroom programming, the child can perhaps gain in all areas simultaneously, and this is the most positive of ultimate goals.

One final comment regarding classroom and therapeutic programming for physically and sensorily handicapped children seems most appropriate. The affective, emotional nature of the

child is often the least considered in our programming. The child with spastic quadriplegia, for example, often is very frightened of movement, particularly sudden movement. Such fearfulness is often present likewise in children with visual and/or hearing deficits and can only be compounded if the sensory and physical handicaps co-exist. Every time we handle these children we bombard them with tactile, vestibular, proprioceptive, and kinesthetic messages often far beyond their abilities to integrate and understand in the absence of the visual and auditory integrative senses and in conflict with the abnormal input they receive from their own motor systems.

It is a small wonder these children frequently cry or cling when moved about their classrooms, unless they have developed intuitive recognition and acceptance of classroom personnel as familiar caretakers. The development of this trust occurs much more spontaneously in the home, and teachers can often learn from the interactions of a handicapped child and his or her family. All concerned, however, need to approach the multi-handicapped child with consistent and careful handling, to plan their days so that recognition and anticipation of events occurs, and to expend considerable energy building affective relationships with the child, which will develop his or her trust and encourage his or efforts to explore and to develop new abilities.

References

Bobath, K., & Bobath, B. An analysis of the development of standing and walking patterns in patients with cerebral palsy. Physiotherapy, 1962.

Bobath, K., & Bobath, B. Cerebral palsy. In P. H. Pearson and C. E. Williams (Eds.), Physical therapy services in the developmental disabilities. Springfield, Il,: Charles C. Thomas, 1972.

Connor, F., Williamson, G. G., & Siepp, J. (Eds.). A program guide for infants and toddlers with neuromotor and other developmental disabilities, Parts I and II. Experimental Edition, United Cerebral Palsy Associations, Inc., 1976. Recently published through Teachers College Press, 1234 Amsterdam Avenue., New York, N.Y. (c. 1978).

Fieber, N. Movement in communication and language development of deaf-blind children. Materials presented at the National Deaf-Blind Workshop for Physical Therapists, Occupational Therapists, and Recreational Therapists, Dallas, August 1975. Available through Ms. Fieber, Assistant Professor, Allied Health/Pediatrics, Infant Development Program, Meyer Children's Rehabilitation Institute, 444 South 44th Street, Omaha, Nebraska.

Fieber, N. When the sensory handicapped child has cerebral palsy. Material presented at the Midwest Regional Center for Services to Deaf-Blind Children Teachers'sWorkshop, South Bend, Indiana, October 1974. Available through Ms. Fieber, as above.

Finnie, N. Handling the young cerebral palsied child at home (2nd ed.). New York: E. P. Dutton, 1975.

Fiorentino, M. Normal and abnormal development: Influence of primitive reflexes on motor development. Springfield, Il.: Charles C. Thomas, 1972.

Fiorentino, M. Reflex testing methods for evaluating CNS development (2nd ed.). Springfield, Il.: Charles C. Thomas, 1973.

Moore, J. Structure and function of the nervous system in relation to treatment technique. In L. J. Zamir (Ed.), Expanding dimensions in rehabilitaion. Springfield, Il.: Charles C. Thomas, 1969.

Barbara Rowe
29 Sessions Street
Providence, Rhode Island 02906

Some Aspects of Gross Motor Development

Martha Dodd

People are motor-driven individuals. The newborn's movement is controlled by reflex activity. As s/he matures, reflex activity becomes integrated, and the infant's motor activity becomes under more cortical control. All motor development occurs in a cephalo-caudal direction and proximal-distal direction. This means the infant first acquires head control, then shoulders, then trunk, and on down his body to its feet. Proximal-distal means from the midline out. The infant will acquire shoulder control before hand control, hip control before feet control. This development allows parts to move independently and to perform their functions as parts. For example, when differentiation has occurred, children can draw using their fingers and wrist, not their whole arm.

There are three components to all motor activity: flexion, extension, and rotation. In the newborn, flexion is predominant. (This is the only position possible in utero.) The infant can lift its head independently when lying on its back by six months of age. Thus, control of the flexion component at the head is complete. The infant has acquired enough control if it has acquired flexion in the rest of its body by the age of ten months, but further skills (mobility, fine motor coordination) need refinement. The infant gains head control in extension by the age of four months. When lying on its stomach, it can lift its head independently. By the age of eight months most extension in the rest of the body has developed and refinement of extension continues to develop. Rotational movements are a combination of flexion and extension, and all functional movements use rotation. It develops at the same time as flexion and extension are developing. A counter-rotation of the shoulders and hips is seen in crawling and walking motions. Rotation occurs between shoulder and hips when rolling. Full, then partial rotation is used when standing from a lying position. It is seen in fine-motor skills, especially at the wrist when writing or buttoning a shirt, for example. When rotation is absent or decreased, a child walks stiffy. If a child has an imbalance between flexion and extension, this will alter rotation, thus affecting his or her motor performance. In gross- and fine-motor skills, coordination and skill development will be decreased if the rotational component is not developed.

As motor activity in the infant becomes more goal directed, the child must develop laterality and directionality. Laterality is an internal process; it is an awareness within the body of the difference between right and left. Laterality gives subjective directions in space: up, down, left, right, before, and after. Laterality must be learned. The child learns this by moving two halves of his or her body, by experimenting and observing differences between these movements. The reference point of

laterality is the midline. Infants first manipulate an object at the midline with both hands. Both hands are engaging in bilateral activity. Later, the child is able to transfer an object from one hand to another; some differentiation between sides is beginning. As further laterality develops, the child can use one hand to hold an object, and the other hand to manipulate another object as in writing. Then the two hands can perform separate functions as in playing the piano. Some children learn to avoid laterality. For instance, a child may appear rigid and make small movements resembling those of the dominant hand. The opposite problem can occur when the child becomes one-sided. S/he uses one side of the body for most activities and ignores the other side.

Directionality is a continuum of laterality. It is the projection of up, down, over, under, before, and after into external space, or objective space. Young children are constantly experimenting with their bodies and its relationship to external space. They try to go under a chair or squeeze themselves between two permanent objects. An important factor in developing directionality is control of the eyes. Visual information can give directional concepts and can guide the motor activity of the child. In blind children or children with low vision, directional concepts are learned through kinesthetic information, and these concepts may be slower to develop. Children need to develop good laterality and directionality if they are to develop spatial relationships. Laterality is mastering subjective space or the space the body occupies. It requires directional concepts within the own body. Directionality is mastering external space and the body's relationship to that space. Laterality and directionality are closely related to the development of body image. These concepts are learned primarily through movement and the kinesthetic information gained from the movement.

Eye-hand and eye-foot coordination are important for perceptual-motor skills to develop. First the child moves its hand and watches its hand as it moves. The eye is taught to see what the hand feels. This first step would be hand-eye. Next, the eye begins to lead the hand. As visual information is received, the hand is used less and is used only to confirm what the eye has seen. This second stage is eye-hand. Gradually the eye begins to control the hands. It leads, guides, and directs the hands' movements. Here the perceptual information gained from the hand is closely matched. Finally, the eye can perform alone. It does not need the hand to confirm the perceptual information. The perceptual data and motor data are matched, and they can be translated into the other. Here the perceptual-motor match is established. Eye-foot coordination is important in locomotor activities and if it is inadequate, a child will have a difficult time controlling motor activity. Activities involving eye-hand coordination on a gross-motor level would be: throwing a ball toward a target, catching a ball, and hitting a ball with a bat. Eye-foot activities good for coordination are walking through a double ladder, jumping on carpet squares, or kickball.

Besides visual perception, the child must learn kinesthetic perception. Kinesthetic perception means knowing where one's body parts are in relation to space. It is "getting the feel of a particualar movement." Also, kinesthetic perception is learning to perform a motion with minimum effort to produce maximum results. One aspect of this is postural control. Gravity is the source of sensory input that influences posture. Humans assume an antigravity posture and their bodies are continually reacting to remain upright against the downward pull of gravity. Their bodies constantly undergo changes in muscle tonus to maintain the assumed posture. These are called postural reactions. When the body is in motion, it also makes changes in muscle tonus to maintain equilibrium. These are equilibrium reactions and are used in movements from walking to gymnastic stunts. Good balance is important to the efficiency of one's movement. Many children have difficulty in balancing on one foot or tandem walking on a balance beam. Laterality plays a role in the balance mechanism. The child must learn to control one side of its body against the other side, to make the proper adjustments to maintain his or her balance. Another aspect of kinesthetic perception is gross-motor imitation. This can range from imitating gross-motor movements to imitation of arm and leg movements to finger movements. Imitations can be symmetrical, with arms and legs performing the same motion, or asymmetrical where they perform different movements. Asymmetrical movements are more difficult to imitate, requiring differentiation of right and left side of the body. Finer imitations such as finger movements require differentiation of specific muscle groups to perform the movement, good laterality, and kinesthetic perception.

Motor development begins with random, reflex activity and develops into goal-directed activity. Maturation of the central nervous system and learning experiences allow this development to occur. As sensory input becomes organized, the motor output has direction and becomes more efficient. Sensory input that provides learning experiences and the maturation of the central nervous system are the basis for motor development to occur.

Suggested Readings

Ayers, A. J. Sensory integration and learning disorders. Los Angeles, Ca.: Western Psychological Services, 1972.

Kephart, N. C. The slow learner in the classroom. Columbus, Oh.: Charles E. Merrill, 1971.

Neurodevelopmental Treatment Techniques (Bobath) Workshop. Presented by Dallas Society for Crippled Children, Dallas, Texas, January 7-9, 1977.

Martha Dodd
1903 W. 33 St.
Austin, Texas 78703

AUDITORY ASSESSMENT AND HEARING LOSS

AUDITORY ASSESSMENT

Barbara Franklin

A growing body of evidence suggests that there is a feedback system present at birth, and that the newborn is capable of more than just stimulus-response type behavior. Condon and Sander, of the Boston University Medical Center, reported in the January 1974 issue of Science that as early as the first day of life, newborns move in synchrony with the rhythms and patterns of adult speech. The newborn is a participant in the rhythm of many repetitious speech structures long before he or she uses them for communication. These rhythms comprise a prelinguistic activity of the human infant even at birth.

The critical aspect of the Condon and Sander experiment is that the intensity level of normal conversation is approximately 60-65 dB, and the one-day-old babies tested responded at this intensity level. Eisenberg (1976) stated that "given current gaps in our understanding of hearing processes during early life, the use of conversationally loud levels seems indicated on both theoretical and practical grounds" (p. 125). Eisenberg also reminds us that in 1957 Kasatkin suggested that optimal intensity for observational studies of newborn auditory behavior is around 65 dB. A technique currently being used to test newborn hearing is the Crib-O-Gram, developed by Dr. F. Blair Simmons, head of ENT at Stanford University Medical School. A device used to measure movement of the baby is placed under the mattress of the nursery crib. When a sound is presented, a change in activity is recorded, and an increase of activity is considered to be a response. However, the stimulus used is a noise band which is presented at an intensity level of approximately 92 dB. I am presently planning a research study to see if newborns will respond to speech at lower intensities. This would greatly improve our ability to detect hearing loss at birth.

Eisenberg (1976), Northern and Downs (1974), and Ewing and Ewing (1944) have all reported that up to two years of age, auditory thresholds for speech are lower than for a variety of auditory stimuli, including noisemakers, noise bands, and warbled pure tones. What is also important is that Northern and Downs reported significantly smaller standard deviations for speech thresholds for each age level tested. This means that speech is a particularly reliable auditory stimulus to use. Eisenberg studied the neonate's response to auditory stimuli for many years. She noted that speech-like signals seemed remarkably effective in producing responses in newborns. She also reported studies which support the notion that speech-like signals are processed differently and at relatively high levels of the auditory system.

Certainly, the purpose of a newborn hearing testing should be to predict the neonate's future ability to use his/her hearing. It is important to remember that studies by Goldstein, McRangle, and Rodman (1972) indicated that any lesion in the auditory pathway higher than the brain stem does not result in a reduction of hearing acuity. All of the studies cited show that individuals with temporal lobe tumors, and even hemispherectomies, demonstrate normal acuity on pure-tone audiometric tests. This is particularly important to remember, because many deaf/blind children are being given brain stem hearing tests. With no other audiological information available, I have strong concerns about using these electrophysiologic test results to make decisions about hearing. These tests also usually use a click as the auditory stimulus. It seems to me, however, that the response of a newborn to speech is a better predictor of future ability to use hearing for speech that a non-speech sound such as a click, noise band, or warbled pure tone.

The normal development of hearing has relevance to this discussion. At birth the newborn has already been shown to move in rhythm to speech. Butterfield (1968) reported that one-day-olds, using sucking, controlled onset and offset of recorded music. Eimas (1971) reported one-month-old infants could differentiate /p/ from /b/. Cutting and Eimas (1975) reported that two-month-olds were able to differentiate /b/ from /d/. Morse (1972) reported that infants 40 to 54 days old are capable of making intonation differentiations. Weir (1966) reported that suprasegmental features such as pitch, rhythm, and intonation, are monitored by four to five months of age. He found that five-month-old Chinese children produced intonations of the Chinese language and that a five-month-old Polish infant babbling can be distinguished from an English infant babbling. Kaplan (1969) reported that eight-month-old infants could differentiate between the intonation of questions and answers.

Meltzoff and Moore (1977) found that infants between 12 and 21 days of age were able to imitate both facial and manual gestures. It seems that infants can match their own unseen behaviors with gestures they see others perform. Piaget and other developmental psychologists have stated that this ability emerges somewhere between eight and twelve months of age. However, it seems that this ability emerges somewhere between the second and third week of life. The implications for our conception of innate abilities and cognitive development are mind boggling.

The Meltzoff and Moore (1977) study indicates that the infant is able to use visual and proprioceptive information by the third week of life, and the study by Condon and Sander (1974) indicates that the infant moves in synchrony with the speech he or she hears on the very first day of life. Both studies indeed stand as a challenge to Piaget, who places cognitive

development as beginning when the sensori-motor period ends at 18 months. If hearing is used from birth by the normally developing infant, the need for early identification, and therefore early and proper amplification of deaf/blind children, cannot be stressed too strongly.

I would like to present another very important reason to use speech to test hearing in children. A growing body of research indicates that there is hemispheric specialization for various auditory stimuli. A little hearing physiology is needed here. The way the auditory pathway operates is that about two-thirds of the nerves that leave the right ear cross over and arrive at the auditory cortex on the left side of the brain. In almost all individuals the left side or hemisphere of the brain is specialized for speech reception, processing, and expression. The right hemisphere is specialized for nonspeech auditory stimuli, which would probably include pure tones and noise bands--the most commonly used stimuli to test hearing. This is speculation on my part, but the evidence of hemispheric specializtion adds to my concern that a child's ability to respond to nonspeech auditory stimuli--hence right hemisphere dominance--be generalized to his or her ability to respond to the spoken word--left hemisphere dominance.

I attended a brain conference in New York last year sponsored by the New York Academy of Science, where Turkewitz (1977) presented some data relevant to this point. He found that before 12 hours of age, one-half of the newborns turn their heads to the right, and one-half turn their heads to the left. However, by 12 hours of age, 91% of the newborns lie with their heads turned to the right. Remember that the majority of the auditory fibers leaving the right ear arrive at the left hemisphere in the brain, and the majority of the auditory fibers leaving the left ear arrive at the right hemisphere in the brain. With the head turned to the right, the right ear is exposed, and more of the auditory stimuli arrive in the left hemisphere, the speech and language hemisphere.

The following experiment which Turkewitz reported seems to be of extreme importance. He presented speech separately to the right ear or left ear of newborns, and found equal rates of turning to the right or to the left. When white noise was presented separately to the right and left ears, there were also equal rates of turning to the right or left. However, when speech was presented to the right and left ear at the same time, there were more head turns to the right, and when white noise was presented to both ears simultaneously, there were more head turns to the left. This certainly indicates the possibility of hemispheric specialization from birth to speech and nonspeech stimuli, and emphasizes the appropriateness of using speech as an auditory stimulus for newborn hearing testing.

I will now describe the typical responses to sound, from birth to two years of age, as reported by Northern and Downs (1974). From birth to six weeks a common response to sound is arousal. Other responses include:

1. Reflexive
   Moro response--stiffening of the extremities
   Eye blink

2. Change in ongoing behavior--either an increase or decrease of activity. For example, if the baby is crying and stops when he or she hears the sound, that is a response. If the baby is quiet and starts to cry when he or she hears the sound, that is also a response.

3. Tensing of entire body

From six weeks to four months, the responses to the auditory stimuli are essentially the same for the 0 - six-week age level, except for a new response which occurs at this stage. This is an orienting response which is a searching for sound.

Up to the age of four months, it does not matter where the sound is presented to the infant. However, after this age it is essential that the sound be presented to one side or to the other side, as the infant will turn his or her head in the direction of the sound.

The response to sound from four to seven months is a 90^{o} head turn to either side → the first sign of the ability to localize.

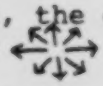
The response to a sound at seven to nine months is to the side and then down ↴. In order to get this response, the child is seated in the mother's lap and the sound is presented, out of sight, to one side of the chair, near the floor, and then to the other side. If the child responds with just a head turn to the side, instead of to the side and down, although this may indicate that the sound has been heard, the type of head turn may indicate a lowered developmental level. Instead of using the response of a seven to nine-month-old, the response is that of an infant four to seven months old.

The response of the infant, nine to 13 months of age, is directly down ↘. The infant at this stage can locate sound directly below. Again, if the child responds by just a head turn to one side or to the side and then down, it may indicate some motor retardation.

The response of the child from 13 to 16 months of age is to the side and up ↗. If the child is unable to locate a sound

over his or her head by this age, again a delay in motor development may be indicated.

The response of the child from 16 - 21 months of age is directly above ↗.

Somewhere between 21 and 24 months of age, the child is able to localize -- find sound -- at any angle  .

John Samples is a recent graduate of the San Francisco State University-U. C. Berkeley joint doctoral program in special education. He investigates (Samples and Franklin, in press) the responses of seven-to-nine-month-old infants to three auditory stimuli--a warbled pure tone of 3000 Hz, a noise band of 2000-4000 Hz, and natural speech which was "Hi baby, how are you" spoken by a female. The three stimuli were taped and played through a speaker in free field. It is interesting to note that although the ambient noise level of the room was 55-59 dB SPL, hearing thresholds of adults of 10 dB were obtained in this environment, at a signal to noise ratio which is usually considered unfavorable. Incidentally, the ambient noise level of a sound-isloated IAC 1200 testing booth was measured at 40-44 dB SPL. These results are particularly important to me since I do all my testing of deaf/blind children in free field, through earphones or speakers, in a relatively quiet room, right at the program site. Children feel more comfortable and are much easier to test when they are in familiar surroundings with people they know.

For John Samples' study, a speaker was placed 24" from the right or left ear of 36 normal infants -- 18 male and 18 female. Nine males and nine females received the stimuli on the right, and the others received the stimuli on the left. The mean threshold level was 23 dB for speech, 28 dB for the warbled pure tone, and 30 dB for the noise band. The speech threshold was significantly lower than the thresholds for the other 2 stimuli. The standard deviations for the 3 stimuli were: 7 dB for speech, 13 dB for the warbled pure tone, and 30 dB for the noise band. It can be seen that there is less variability for the speech stimulus.

In addition to threshold differences, there were also differences in the total number of responses to each stimuli: 275 for speech, 187 for the pure tone, and 192 for the noise band. The higher number of responses to speech was also statistically significant.

It is interesting to note that John Samples found that the type of response made by an infant also depended upon which of the three stimuli were used. There were far more head turns

to speech than to the warbled pure tone or noise. The response of looking directly down ↘ occurred only for speech. He also found a significantly higher number of responses to speech for the right ear for females, but not for males. This may indicate some early specialization for speech in the left hemisphere for females, but not for males.

I have been conducting audiometric evaluations of deaf/blind children for a number of years. In order to obtain audiological information for those children who could not be tested using conventional procedures, I developed alternative techniques. I recorded a variety of auditory stimuli--speech, music, a trumpet playing simple nursery rhymes, and sound toys. The tape is played through an audiometer, and the intensity can be regulated by the attenuator dial. The speech, music, and trumpet are used to determine awareness thresholds, and in some instances, the ability to discriminate different auditory stimuli. The sound toys are used to obtain a crude audiogram, since the frequency range of the toys was established through spectrographic analysis. For example, there is a bell with no visible energy below 1500 Hz, and another bell with no visible energy below 2500 Hz. If a child responds to one or both of these bells, a crude audiogram can be obtained.

I will now show a videotape which demonstrates some of the techniques I have been discussing. The tape contains segments of the auditory evaluation of eight deaf/blind children conducted by me, including low-functioning children whose responses had to be inferred by observing changes in their behavior, and higher functioning children who were able to be conditioned to different kinds of play audiometry. The test tape consists of a trumpet playing simple nursery rhymes, music, calibrated sound toys, and speech.

Subject #1

Disregarded trumpet and music; smiled to bell which has no acoustic energy below 1500 Hz and disregarded bell which has no energy below 2500 Hz.

Subject #2

As stimulus was switched from one ear to the other, the subject reached for appropriate earphone.

Subject #3

Generally unhappy; no response to trumpet or music; quieted to sound toys. Attended to and vocalized /m/ to speech.

Subject #4

When intensity was increased, subject reached for earphones, pulled them off, and poked fingers in ear. With hearing aids, quieted when stimuli came through speaker. Increased activity when stimuli was turned off.

Subject #5

Listening behavior; reached for earphones when trumpet stopped and music started; changes in facial expression seem to indicate awareness of change of stimuli; reached for earphones when stimuli was very intense. Vocalized /ü/ to speech; whole behavior changed with speech including rocking. Independently held earphones to ears by herself; again vocalized /ü/ to speech. Got on table to feel vibration produced by stimuli coming through speaker.

Subject #6

With hearing aids, was conditioned to throw a bean bag or to put hand with puppet in air when pure tones were presented through speaker.

Subject #7

Did not want to wear earphones; then quieted and attended to stimuli; when intensity was increased, screamed, pulled off earphones, and scratched ear. Followed directions on tape appropriately to "stand up" and "sit down."

Subject #8

With hearing aids, was conditioned to raise hand when pure tones were presented through speaker. With hearing aids, was able to discriminate "red, blue, and yellow" via ear alone without the benefit of lip-reading.

As seen on the videotape, several children responded only to speech, and the majority of the other children had lower thresholds for speech than for the other stimuli, including pure tones, music, and sound toys. I will now describe a new audiometric testing technique I developed which can be used as an alternative or supplement to conventional pure-tone audiometry. Since speech has been found to be the most effective auditory stimulus for obtaining a response in newborns, infants, and young children, it seemed to me that speech might also be an effective stimulus with low functioning, hard-to-test individuals as well. Although there is agreement that speech is the most effective elicitor of response, it has not been used because of the inability to obtain quantitative information corresponding to an audiogram.

I have recorded the phrase, "ah ah clap clap clap." This phrase was chosen for the following reasons:

1. Eisenberg used the vowel /ä/ in most of her studies because this vowel is part of the infant's repertoire. The vowel is said with a rising and lowering intonation pattern, ä ◡ ä, because the newborn probably responds more to the supra-segmental phonemes of pitch, rhythm, and intonation than to the segmental phonemes--the vowels and consonants.

2. Condon and Sander found much movement in the newborn in response to the /k/ in "come." The word "clap" was chosen because it has two voiceless phonemes, the /k/ and /p/. The words "clap clap clap" are said in the rhythmic pattern ___ ___ ___ to provide contrast to the sustained voicing of "ah ah."

The speech phrase has been filtered into five speech bands. Each band is centered at one of the test frequencies on an audiometer with a high-frequency as well as a low-frequency cut-off for each band. The 250 Hz speech band has a range of 125 - 375 Hz; the 500 Hz speech band has a range of 250 - 750 Hz; the 1000 Hz speech band has a range of 750 - 1250 Hz; the 2000 Hz speech band has a range of 1500 - 2500 Hz; and the 4000 Hz speech band has a range of 3000 - 5000 Hz. The frequency range of the bands was varied in order to maintain equal energy levels for each of the five speech bands. A threshold level is obtained for each speech band.

In order to establish the validity of the filtered speech technique, I obtained audiograms on easy-to-test hearing-impaired children, and I compared their pure-tone and speech-band audiograms.

SUBJECT G. R.
RIGHT EAR

STIMULUS	250 Hz	500	1000	2000	4000
PURE TONE	60 dB	85	80	80	90
SPEECH BAND	55	70	70	65	75

LEFT EAR

STIMULUS	250 Hz	500	1000	2000	4000
PURE TONE	50 dB	80	80	80	65
SPEECH BAND	55	70	70	70	55

CONVERTED TO SOUND PRESSURE LEVELS (SPL)
RIGHT EAR

STIMULUS	250 Hz	500	1000	2000	4000
PURE TONE	85 dB	96	87	89	99
SPEECH BAND	74	89	89	84	94

LEFT EAR

STIMULUS	250 Hz	500	1000	2000	4000
PURE TONE	75 dB	91	87	89	74
SPEECH BAND	74	89	89	89	74

SUBJECT R. B.
RIGHT EAR

STIMULUS	250 Hz	500	1000	2000	4000
PURE TONE	60 dB	75	85	90	85
SPEECH BAND	60	75	75	75	70

LEFT EAR

STIMULUS	250 Hz	500	1000	2000	4000
PURE TONE	60 dB	80	90	90	85
SPEECH BAND	65	70	75	80	75

CONVERTED TO SOUND PRESSURE LEVELS (SPL)
RIGHT EAR

STIMULUS	250 Hz	500	1000	2000	4000
PURE TONE	85 dB	86	92	99	94
SPEECH BAND	79	94	99	94	89

LEFT EAR

STIMULUS	250 Hz	500	1000	2000	4000
PURE TONE	85 dB	91	97	99	94
SPEECH BAND	84	89	94	99	94

The results for Subject G. R. were typical, and it can be seen that the two audiograms differ by approximately 10 - 15 dB at each test frequency. However, when the pure tones and speech bands are converted to sound pressure levels, the two audiograms are remarkably similar at each test frequency. Subject R. B. demonstrates similar results when the pure-tone and speech-band audiograms are compared--approximately 10 - 14 dB difference at each test frequency regarding sensation level. The results, again, for the pure-tone and speech-band audiograms are in closer agreement regarding sound pressure level.

I have obtained audiograms using the speech-band technique for many hard-to-test, low-functioning, deaf/blind, and/or retarded children and adults for whom audiograms could not be obtained using conventional pure-tone audiometric procedures. Typical results were:

SUBJECT E. S.

STIMULUS	250 Hz	500	1000	2000	4000
SPEECH BAND RIGHT EAR	30 dB	30	40	40	40
SPEECH BAND LEFT EAR	30	30	30	30	30

SUBJECT D. J.

STIMULUS	250 Hz	500	1000	2000	4000
SPEECH BAND RIGHT EAR	50 dB	50	60	60	70
SPEECH BAND LEFT EAR	30	30	40	40	50

Subject D. J. was not wearing amplification because of the lack of audiological information from previous hearing tests. However, I prescribed a mild-gain hearing aid for the right ear on the basis of the speech-band audiogram. Because of the severe retardation of subject E. S. it can be assumed that hearing is normal or near normal. Prior to speech-band testing, it had been recommended that he be fitted with a powerful auditory training unit. On the basis of the speech-band audiogram, I recommended that no amplification seemed to be indicated at that time.

I am currently attempting to obtain funding to disseminate my speech-band tapes to interested audiologists for large-scale field testing. I would like to conclude my presentation today with the following quotes from Eisenberg's new book, Auditory Competence in Early Life, the Roots of Communicative Behavior:

> The recent explosion of neurophysiologic data on hearing has had few repercussions at the clinical levels, mainly because scientists concerned with behavior and scientists concerned with the mechanisms underlying that behavior seemed unable to communicate with each other. . .It is neither realistic or productive to ascribe limitations in current clinical practice to difficulties inherent in dealing with the pediatric aged or to lack of information. The problems, although they have historical roots, stem mainly from inertia. . .For the moment, pediatric audiology is a myth, and differential diagnosis of the pediatric aged is all too often an exercise in futility. . .We badly need new ideas that are pertinent to these disorders. We need normative information in order to define which functions are affected and in what ways. We need new clinical measures that refer quantitatively to specific coding operations. Most of all, we must attack these needs in rational order and ask critical questions about current priorities. Do we need to use pure tones or other abstract signals when speech and speech-like sounds are more effective elicitors of response? (pp. 149, 151, 152)

It seems to me that the speech-band audiometric technique that I have developed is a logical and natural clinical application of the neurophysiologic data available on the development of auditory behavior.

References

Butterfield, E. C. An extended version of modification of sucking with auditory feedback, Working Paper #3, Bureau of Child Res. Lab., Children's Rehab. Unit, Univ. of Kansas Medical Center, 1968.

Condon, W. S., & Sander, L. W. Neonate movement is synchronized with adult speech: Interactional participation and language acquisition. Science, 1974, 183, 88-101.

Cutting, J. E., & Eimas, P. D. Phonetic feature analyzers and the processing of speech in infants. In J. F. Kavanaugh and J. E. Cutting (Eds.), The role of speech in language. Cambridge, Mass.: MIT Press, 1975.

Eimas, P. D., Siqueland, E. R., Jusczyk, P., & Vigorito, J. Speech perception in infants. Science, 1971, 171, 303-306.

Eisenberg, R. B. Auditory competence in early life. Baltimore, Md.: University Park Press, 1976.

Ewing, I. R., & Ewing, A. W. G. The ascertainment of deafness in infancy. Journal of Laryngolgy and Otolology, 1944, 59, 309-333.

Goldstein, R., McRangle, C., & Rodman, L. Site of lesion in cases of hearing loss associated with Rh incompatability: An argument for peripheral impairment. Journal of Speech Hearing Disorders, 1972, 37 (4).

Kaplan, E. L. The role of intonation in the acquisition of language. Unpublished doctoral dissertation, Cornell University, 1969.

Meltzoff, A., & Moore, M. Imitation of facial and manual gestures by human neonates. Science, 1977, 198, 76-78.

Morse, P. A., The discrimination of speech and nonspeech stimuli in early infancy, Journal of Experimental Child Psychology, 1972, 14, 477-492.

Northern, J. L., & Downs, M. P. Hearing in children. Baltimore, Md.: Williams and Wilkins, 1974.

Samples, J., & Franklin, B. A comparison of thresholds in 7 to 9 month old infants to speech and nonspeech auditory stimuli. Journal of Auditory Research, in press.

Turkewitz, G. The development of lateral differentiation in the human infant. In New York: Evolution and lateralization of the brain. New York Academy of Science., 1977.

Weir, R. H. Some questions on the child's learning of phonology. In F. Smith and G. Miller (Eds.), The genesis of language. Cambridge, Mass.: MIT Press, 1966.

Suggested Readings

Franklin, B. The effect of combining low and high frequency passbands on consonant recognition in the hearing impaired. Journal of Speech Hearing Disorders, 1975.

Franklin, B. Analysis of discrimination scores of congential sensorineural loss subjects. Journal of Auditory Research, 1967, 16.

Franklin, B. Split-band amplification and speech-band audiometry. In Hearing instruments. New York: Harcourt, Brace, Jovanovich, in press.

Franklin, B. Air-bone amplification. In Hearing Instruments. New York: Harcourt, Brace, Jovanovich, in press.

Franklin, B. One aid or two? Handbook of binaural amplification. Grune Stratton, in press.

Simmons, F. B., & Russ, F. N. Automated newborn hearing screening, the Crib-O-Gram. Archives of Otolaryngology, 1974, 100, 1-7.

Wickelgren, W. Memory. In Psychology and the handicapped child. Washington, D.C.: U.S. Government Printing Office, 1974. 73-108.

Barbara Franklin
Coordinator, Deaf/Blind Program
Department of Special Education
San Francisco State University
San Francisco, California 94132

USE OF IMPEDANCE MEASURES TO PREDICT SENSORI-NEURAL HEARING LOSS

Dean Harris

I'm going to discuss with you the prediction of sensori-neural hearing loss by the use of impedance measures. Today we can test anyone if we take him or her to a good audiologist who has a lot of patience and a lot of time. Not all audiologists have the time, equipment, patience, or know-how to work with young hard-of-hearing children. Thus, we need a method to confirm our meager findings or to actually predict the level of hearing, an objective measure which would give this type of information. We don't have any trouble testing hearing once a child reaches the age of three or four, if he or she has normal intelligence, normal speech and language, normal motor abilities, and can understand what we tell him or her to do. It is the younger child, or the handicapped or mentally retarded child that sometimes gives us trouble.

Impedance audiometry holds great promise, in that it is objective; it does not require a voluntary response from the individual being tested. It can be performed under sedation if necessary, or when the child is asleep.

Viewed as a test battery consisting of compliance, tympanometry, and stapedius reflexes, impedance audiometry gives an accurate picture of the function or lack of function of an ear. Like any test, no part of this test will stand alone. The professional will want as many test results as he or she can get to find a pattern of results. That is the only way to predict what is going on in the middle ear, the cochlea, or the brain stem.

It is a simple matter to discover if someone has a conductive problem with impedance audiometry because the results show tympanogram patterns that vary from the normal, or "Type A." To predict the degree of hearing problem is more involved. In the conductive loss it is not that important because professionals have found that the child does have a medical problem, and he or she is sent to the physician's office. Hopefully, medical science will correct this problem and we can test the child again and see if there might be a residual sensori-neural loss.

If we find normal results for compliance, tympanometry, and reflexes, we really don't know what we are dealing with because this child could have normal hearing or a recruiting sensori-neural loss. They will appear alike on impedance testing. So if we find normal results on impedance testing, we still have to do a hearing test in most cases. Tympanometry and compliance will be identical to what is found on normal ears. However, there will

be differences in the levels at which the stapedius muscle reflex occurs in response to different types of auditory signals. Keep in mind that any middle ear problem will obliterate the stapedius reflex, and the tests using the reflex to predict hearing level can only be performed when there is a normal middle ear, and thus a normal tympanogram.

In 1972, Niemeyer and Sesterhenn of Phillip University in Germany reported a method of predicting the level of loss in sensori-neural hearing problems and to predict the slope of the audiogram. A child with a sloping sensori-neural loss is going to be handled differently in rehabilitation from the child with a flat loss, so it is important to know the slope of the loss as well as the degree of loss.

It is known that the reflex of the stapedius muscle is a response to loudness; not to hearing level, not to sensation level, not to sound pressure level, but the loudness as perceived by the listener. In addition, the same stimulus will elicit a reflex in either the waking or sleeping states, so we don't require a wide-awake child. We know that the reflex is at a subcortical level and we know that loudness is monitored in the brain stem. Several researchers have found that broad-band noise sets off the reflex at a lower sensation level than does a signal like a pure tone. The reason is that loudness is summated, and a broad-band noise of 30 dB sounds louder to the listener than does a pure tone of 30 dB because the total energy in the broad-band noise is considerably greater. If we were to plot normal hearing thresholds on an audiogram, we would find reflexes to tones at about 85 dB, but the reflex to broad-band noise might occur at about 50 dB, i.e., a lower sensation level. In a sensori-neural loss we might find hearing thresholds of 50 dB, with reflexes due to tones still at about 85 dB, but reflex due to broad-band noise might be at 70 dB. In other words, the sensation level of reflex for the two types of signal becomes closer together as the hearing level required for a noise reflex is increased more than the hearing level required for a tone reflex.

Brad Harlow gave a definition of recruitment in his presentation. It is an abnormal growth in loudness as the intensity of the sound (on the audiometer, for example), is increased. Sound gets uncomfortably loud too close to threshold, so that for a person with no hearing loss, 85 dB might be loud and for a person with, for example, a 50 dB sensori-neural loss and recritment, 85 dB might also be uncomfortably loud. This is a hair cell problem, so when I talk about sensori-neural loss, I am really talking about cochlear losses because we've got to have a reflex, and we don't always get one with retrocochlear losses such as an eighth nerve lesion.

Niemeyer and Sesterhenn came up with a formula based on this relationship which allowed them to predict hearing level. We have

been unable to repeat the results they got. They took the tone reflexes and calculated the average reflex level at 500, 1000, 2000, and 4000 Hz. From this they subtracted the level of the noise reflex. They then multiplied this difference by 2.5, and the resultant figure was subtracted from the average level of tone which caused the reflex. This became their prediction of the sensori-neural hearing level. They reported excellent accuracy for the 232 ears in their study. Seventy-three percent of their predicted levels were within 10 dB of actual thresholds. An additional 17% were within 15 dB, and the final 10% were within 20 dB of actual hearing thresholds. As I said earlier, we have been unable to duplicate their results. To predict slope of the audiogram, Neimeyer and Sesterhenn used a mixture of 12 tones from the low frequencies to determine a reflex threshold and a mixture of 12 high-frequency tones to determine a reflex. A comparison of these two levels gave a prediction of the slope of the audiogram.

In 1974, Jerger and his colleagues published a study based on the work of Neimeyer and Sesterhenn. It is interesting that Neimeyer's work was reported in 1972 at the International Audiology Convention in Budapest, but was not published until 1974 and came out after Jerger's publication, which was based on Niemeyer's work. Thus, Jerger gets most of the credit for predicting hearing level on the basis of impedance, but Jerger is the first to acknowledge the work of Niemeyer and Sesterhenn.

Jerger and his colleagues reported on 1,043 ears that they had evaluated in Houston, looking at every possible combination of stapedius reflex levels from various tones versus noise. They took the 500, 1000, and 2000 Hz reflex threshold average and subtracted from it the broad-band noise reflex threshold. From this prediction, they placed patients into one of four categories: 0 to 19 dB was called normal hearing, 20 to 49 dB was called mild to moderate loss; 50 to 84 dB was called a severe loss; and 84 dB or greater was called a profound loss (See Table 1). These are rather broad categories and the prediction is not precise, but it is better than anything we have had previously.

For the 1,043 ears, Jerger found no error in predicting the category in 60% of his subjects. The prediction was off by one category in 36% of the ears. Let's say the child had a mild to moderate loss. In 35% of the cases she or he might be labeled as normal or as severe, and this is not a terrible error. It is not like predicting normal hearing in a deaf child or vice versa. In only 4% of the 1,043 ears was the prediction off by two categories, a serious error. Of the 41 serious errors, however, it should be noted that 35 normal ears were predicted as having hearing problems. That would not hurt anyone; these kids would get some extra attention. Only six ears with severe losses were predicted to have normal hearing, and this would present a problem, but that is out of 1,043 ears, a terrific score. It is better than anything we've had before, and

Table 1

With NORMAL Tympanograms

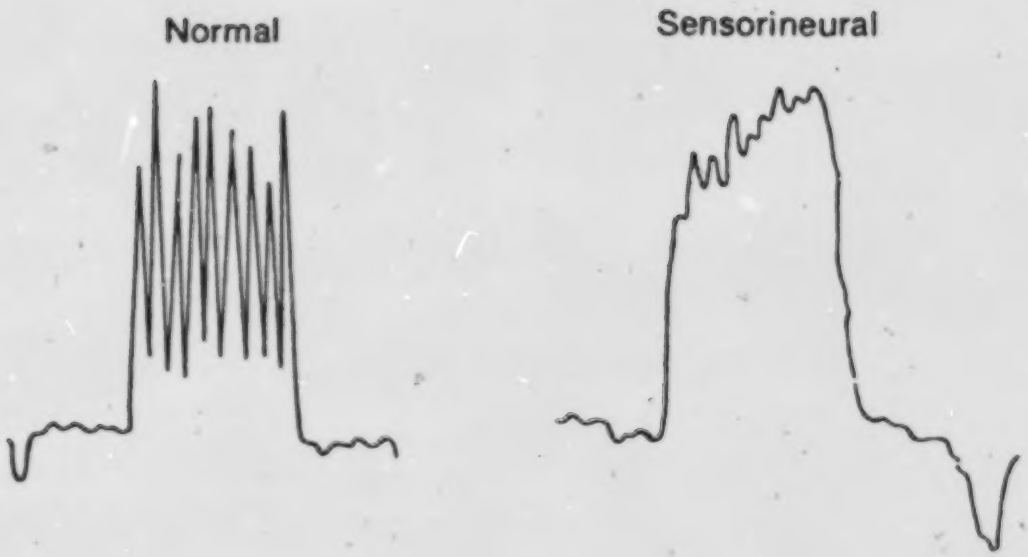
Difference plus correction factor	Noise reflex in SPL	Prediction
20 or more	any level	normal (0-19dB)
15 - 19	80 or less	normal (0-19dB)
15 - 19	81 or more	mild-moderate (20-49dB)
10 - 14	any level	mild-moderate (20-49dB)
less than 10	89 or less	mild-moderate (20-49dB)
less than 10	90 or more	severe (50-84dB)
no reflexes		profound (85dB or more)

we find in our clinic that we get very good agreement with the figures that Jerger has published. We miss about one third of our predictions and put them in the wrong category, but that's not bad. We would like to do better.

In order to use Jerger's chart (Table 1), each individual impedance bridge must be calibrated by the person using it. The way to do this is to take 10 normal listeners, or 20 normal ears. Don't use anyone with a loss even in one ear; use 20 normal ears. You determine the average reflex level for 500, 1000, and 2000 Hz on these normals. Next, you measure the broad-band noise reflex levels, and these should be at a slightly lower intensity level. You then subtract the broad-band noise level from the average tone level and this is your difference. Jerger's difference was 25 dB on normals. In order to use Jerger's chart you must subtract your difference from 25, which will give you a number we will call your correction factor for your individual bridge. When you test a patient, you take your correction factor and add it to the difference you found on the individual patient. This will allow you to use Jerger's chart and to come up with these kinds of predictions.

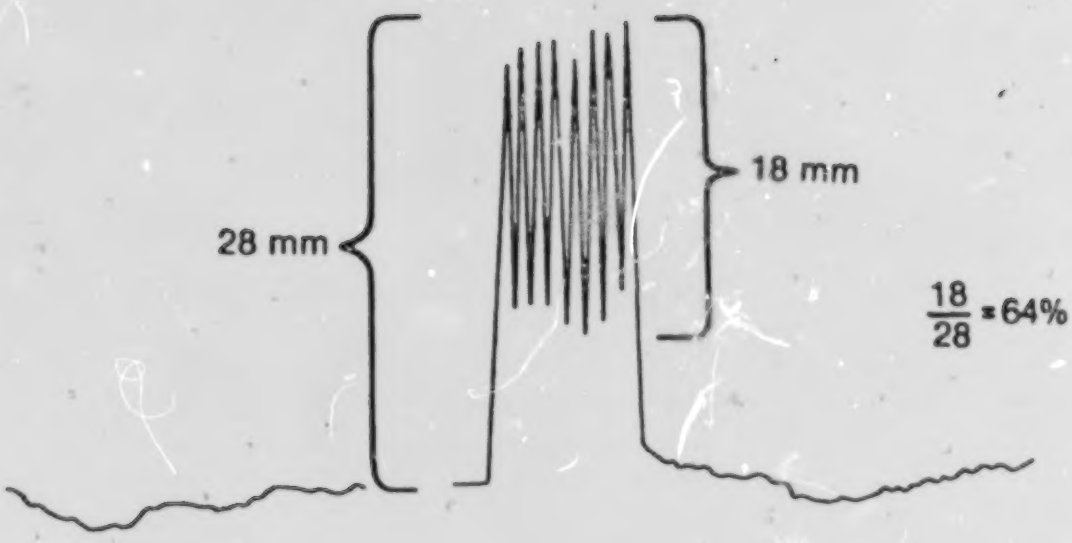
Jerger was also looking to predict the slope of the audiogram, and he used two bands of noise. He used broad-band noise filtered to cut out all sounds below 2600 Hz (high-pass 2600) and broad-band noise filtered to cut out all sounds above 2600 Hz (low-pass 2600). These two noises have roughly equivalent loudness to a normal ear. Jerger elicited reflex thresholds with these two signals and subtracted the high-pass 2600 reflex from the low-pass 2600 reflex threshold. If this difference was zero or a positive number, it predicted a flat audiogram. If the difference was -1 to -5, it predicted a gradually sloping audiogram, and if the difference was greater than -5 it predicted a steep slope with a greater than 40 dB drop between 1000 Hz and 4000 Hz.

There have been other attempts to predict hearing level from the stapedius muscle reflexes. Norris and his colleagues at the University of Nebraska Medical Center in Omaha have developed the reflex relaxation index. They use a Bekesy audiometer to present a pulsing tone to the ear, with the tone on for 200 msec, off for 200 msec, etc. In a normal ear, the reflex relaxes between the pulses of sound (See Figure 1). With an ear having a sensori-neural loss the reflex does not completely relax between pulses, and we do not see the "sawtooth" effect when the reflex is recorded on a strip chart. In order to determine the reflex relaxation index (RRI), the amplitude of the reflex is measured in millimeters from the strip chart. The millimeters of relaxation between pulses are also measured. The total amplitude of the reflex is divided into the amplitude of relaxation to give the reflex relaxation index. In normal ears the RRI was more than 30% and in sensori-neural ears, the RRI was less than 30%. (See Figure 2).



Reflex relaxation (from Norris)

Figure 1



Measurement technique for the Reflex Relaxation Index (from Norris)

Figure 2

Best and his colleagues have used the RRI to predict the level of sensori-neural loss. They predict normal hearing if the RRI is between 45 and 65%, mild loss if the RRI is 30 - 33%, a moderate loss if the RRI is 20 to 30% and a severe loss with an RRI of 10 to 25%. Their data show a fairly large standard deviation, however, and the overlap from one group to the other is rather large. It looks good on paper, but does not predict very well at this time.

In the past, we have measured the reflex with the earphone on one ear and the probe in the other ear. The earphone presents the tone to elicit the reflex and the probe measures its presence. Remember that the nerve impulse goes up the eighth nerve and down both seventh nerves to cause a reflex in both ears, since the reflex is bilateral. When we began we put a tone in the left ear, for example, and measured the reflex on the right ear. Which ear is the test ear? It depends on what you're looking for. I like to call them the stimulus ear and the response ear. If we want to look at the cochlea or at the eighth nerve, the ear with the earphone is the test ear. If we want to look at the seventh nerve or the muscle itself, the ear with the probe is the test ear.

As I stated earlier, in order to look at the reflex in one ear while stimulating the other ear, both middle ears have to have normal tympanograms. If a child has a problem in his or her right ear and the earphone is placed on the right ear, the sound will not get loud enough to cause a reflex. If the probe is placed in the right ear, you still get no reflex because, even though the stapedius muscle tries to pull, the small change in tension on the eardrum cannot be measured against the stiffness already caused by the conductive lesion. So now several manufacturers of impedance bridges offer an ipsilateral reflex measurement where the tone causing the reflex is sent though the probe. This has added a whole new dimension to what we can do by comparing ipsilateral reflexes with contralateral reflexes.

We have already made great strides toward our goal of being able to predict hearing level with accuracy by objective means in the difficult or impossible-to-test patient. Our predictive accuracy leaves much to be desired. We still have only 60% accuracy in predicting within rather broad categories, and can only do this in the presence of a normal middle ear. Research is continuing and it is probably only a matter of time before we will be able to predict with nearly 100% accuracy, so that every child with a hearing loss can be correctly identified and given proper rehabilitation measures at the earliest possible time. If you are impatient about this, remember that only 25 years ago we waited until a child was four or five years old before we put a hearing aid on him or her. We'd tell the parent to bring him or her back when he or she was old enough to raise his or her hand when he heard a tone. That was only 25 years ago, and we deprived generations of kids because we waited too long to give them the amplification they needed. Mrs.

Downs mentioned this morning that we like to get hearing aids on youngsters as early as three weeks of age. The earlier the better. We were missing the important years of development.

What we have now is good, but it is not foolproof. This, like any test, should not be relied upon by itself. I strongly recommend a combination of impedance, behavioral audiometry, and behavioral observations to get a description of the hearing abilities of young children.

Dean A. Harris, Ph.D
Professor of Audiology
Speech and Hearing Clinic
Southern Methodist University
Dallas, Texas 75275

EARLY EVALUATION AND DIAGNOSIS OF HEARING LOSS AND ITS MANAGEMENT

Marion Downs

Early Evaluation and Diagnosis

I'd like to show you the number of additional problems that occur with deafness, as reported by the Gallaudet survey of 29,000 students in deaf and hard-of-hearing schools in the U.S.:

6% behavioral problems
.5% brain damage
3% cerebral palsy
.5% epilepsey
1.3% heart disorders
3% learning disabilities
7% mental retardation
.6% orthopedic
5% perceptual-motor disorders
4½% severe visual disorders

This gives you an idea of the kinds of additional handicaps that can occur with a hearing loss.

First, I'd like to discuss the importance of early identification of hearing handicaps; second, I want to discuss methods to evaluate hearing loss in a handicapped child with other problems; and third, I would like to show how early evaluation and diagnosis helps to plan rehabilitation and training.

We hear a lot about how early identification helps children in their developmental program, their language, and their speech, and this couldn't be truer. As John Cooper told you, there are critical periods for the development of language, and they occur early in life. I would say they occur in the first two years of life. I wouldn't extend it much farther than that because I can quote studies that show a difference of 30-50 IQ points in children who have had poor language stimulation in the first two years of life and those who have had good language stimulation in the first two years of life. These studies point to the age of two as being the critical cutoff point. There are other advantages in early identification. It not only helps the child in his or her development, but it also helps parents, clinicians, and agencies--the agencies that are planning the programs. Let's look at how it helps parents.

It helps them to be parents. A notion exists that mothers are "born," not made. This is not true. Mothers are made, and they are made mothers by the child. Studies now show that mothers don't naturally love a child, hold him or her and do all the mothering kinds of things that are necessary. The mother gets the cue from the baby. Babies are innately attractive, and they make themselves attractive. They begin in early infancy to make the beautiful contented noises that babies make. By two months they produce the smile reflex. Babies have that smile reflex to endear themselves to the mother; it makes her a mother. She is able spontaneously to pick up the baby and love it when he or she smiles and coos. This is terribly important. What happens to the handicapped child, the brain-damaged child, the mentally retarded child, the autistic child, and the deaf child? In all of these children, there is a reduction in those signals the baby sends out. Even in the deaf child, who we know does a lot of cooing and smiling, there occurs a gradual breakdown in the integrity of the signals he or she sends to mother because she/he can't hear. When we are able to identify these handicaps early in life, we can then teach mother how to deal with them. I recall an eight-month-old baby who was a rubella child, deaf/blind, and we found that this child had never been picked up and loved by the mother. The child was ready to be institutionalized; the parents felt he was a vegetable. He had never shown any signs of any real abilities that would allow him to even be trainable. We found out that he had a hearing loss, and we asked for a six-month delay before sending him to an institution. We put binaural hearing aids on him, and by 18 months this child was sitting up and was babbling; by two years he was walking; he was showing signs of being trainable, if not educable. We really saved him, but we had to teach mother how to mother that child. Fortunately, eight months wasn't too late. You should see this child now. He is a very competent child, yet one who had been scheduled for an institution. Early identification helps catch such a child and give him the mothering he must have.

How does early identification help the clinicians? It allows the clinician to evaluate the child better. It's much easier to evaluate deaf children when they're very young before that accumulation of autistic and self-stimulating behavior begins. We can look much better at basic gross-motor skills, and in early life these can be stimulated very well. Some early intervention programs have been reported where gross-motor skills were developed in children. Fine-motor skills also are much easier to work with at this age. For example, these handicapped children have sluggish tongues. It's much easier to stimulate that sluggish tongue in a baby

than in a 5-year-old child who might bite your finger. In auditory behavior, the same is true. It's much easier to see their auditory responses when they are young and before autism and self-stimulation begin. We can provide a super home-training program of auditory stimulation that in these early years is going to make the difference between a child who is not at all adequate and one who is adequate to a training or educational program. The young infant still is quite pure and pristine in its reflexes, and all the reflexes are still there. They are not masked by any kind of inhibited behavior. We'll talk about this later because it is one of the important ways we evaluate children.

Agencies are helped by early identification because they can plan much better for the educational program of a child when a good comprehensive diagnosis is made, and this is so much easier to do early in life. Later on, retrospective studies can in no way give the kind of information that immediate on-the-spot studies with a newborn baby give. So, these factors comprise the advantages to the clinician, the parent, and the agency.

How do we as audiologists or you who are working with children evaluate the hearing of the kind of child who is difficult to test? When evaluating handicapped children we know what kind of auditory behavior emerges at what age in a normal child. We must remember that a handicapped child functions at a certain age level for various functions. If the child is mentally retarded, he or she functions consistently at a certain lower level in all areas, and therefore we can apply developmental norms or auditory norms to the child and find out at what age level he or she is functioning in those areas. In brain-damaged children or children with other problems, it may be difficult to assign an auditory age because there are inconsistencies. But at some point, as you work with a child, you will see behavior that gives you a clue as to what degree of hearing loss the child may have. Let's look at some of these things and see how we can apply them to the handicapped child. A six-month-old child turns and looks just partway to the side when he or she hears a sound. She/he doesn't really find the sound source on a lower level because she/he simply isn't mature enough auditorially to identify a sound source at the lower level. We also know the level of the auditory stimulus that is necessary to produce a response at this age, and we find that a normal child will turn its head to about 25 dB of sound, with a 7 dB standard deviation at this age. This means that 68% of the children at this age will turn their heads to a sound of 18-32 dB. This is a pretty good indication of the auditory behavioral level of this child.

A child of 13 months can identify and find a sound source on the upper level as well as on the lower level. Here the full maturation of the auditory response has developed. At this age the child usually will respond to about 8 dB, with a standard deviation of about 5 dB in this age group. So we know that 68% of all these children will respond within from 2 to 12 dB. If a child is mentally retarded, apply these norms to him or her. But in addition to the knowledge of the auditory norms, we have knowledge of the auditory reflexes that occur not only in normal children but in all children except those who may have brain-stem injury. Any child who does not have a brain-stem injury has auditory reflexes. We know the levels at which the various auditory reflexes occur. The startle reflexes occur at the ponto-medullary junction in the brain stem. The test which identifies disfunction here would be a lack of response to 65 dB of sound level in a quiet sound room. Any child should startle at 65 dB in a sound room if a sudden noise is introduced if his or her hearing is normal. It would take a very, very involved child not to startle, particularly at a young age. Later, when there is an overlay of self-stimulatory behaviors, one has a hard time structuring this startle response because, of course, there is so much other activity going on. In such a case, it would be best to have the child asleep, because then you can structure the situation enough to get a reflexive response to sound. I have found it helpful when doing a myringotomy on a child to give the child a sedative. One can bring a sedated child into the sound room and get a beautiful reflexive response. Even a grossly handicapped child, when he or she is very young, should have a head turn reflex. The orientation where the child begins to turn is dependent on the temporal auditory cortex. In other words, this is a cortical activity in infants over four months. You see them get an "ah-ha" effect, and they turn.

The eye-blink reflex again is mediated at the pons. Any child will have an eye-blink reflex in the sound room when a loud sound is introduced. The eye-blink reflex is mediated in the brain stem, so that if you can structure the situation with a multiply-involved child, you will see the eye blink if she/he has normal peripheral hearing. In other words, we are testing the peripheral mechanism. I'm not saying that this child is integrating the auditory material in his or her brain. My job is to tell you if this child has any peripheral hearing, how much she/he has, whether she/he needs a hearing aid, and how you should train him or her with peripheral hearing. Even the newborn baby, when a sound is made, has a neck-turning reflex. About 60% of the time newborn babies show some degree of a neck reflex, particularly in a sound sleep. The multihandicapped child has this reflex too, until

all those other behaviors are superimposed on the child and make it much more difficult to see. The startle reflex also is seen to a 65 dB voice sound.

These are the kinds of things that help us evaluate the deaf/blind child, the mentally retarded child, the brain-damaged child. These retarded and handicapped children are still on the continuum on normalcy from complete normalcy down to severely handicapped, and therefore we can use normal behavior to evaluate what these handicapped children can or cannot do.

Otologic research has provided knowledge about different clinical entities, which helps predict what might be the cause of a given disease entity. An accurate diagnosis of the cause of the problem provides a good lead regarding what to expect from a given child in a testing situation, in therapy, or in his or her future education. It's helpful to refer to the high risk register, which has been now recommended by the Joint Committee on Infant Screening and by HEW in its Medicaid bulletin. I use the mnemonic aid that a pediatrician, Dr. Silver, and I developed and published in Clinical Pediatrics. We call it the ABCDS to HEAR. A stands for affected family members; this means if there is anyone in the family who had childhood deafness, then this child is suspect for possible inherited deafness. Twenty-seven percent of all deaf children in our studies fell into the inherited group. B stands for billirubin count. This refers to the Rh or ABO blood incompatibility in children; about 17% of all our children with hearing losses fell in this category. They also may have brain damage and other problems. C stands for congenital rubella syndrome, and in our study 25% of the children fell into that group. D stands for defective ear, nose, and throat. S stands for small birth weight--birth weight less than 1500 grams is the official birth weight. Meningitis was added by the Academy of Pediatrics, which felt that meningitis had to be added in order to include everything that's important.

Let's look at these different disease entities to learn what we can about the snydrome or the disease entity from the information research has given us--how that helps us in planning for the program and also in identifying. Before we go to that, I'd like to present our latest figures in an ongoing, routine, high-risk program from May 1972 to January 1976 during which time 8,358 children were screened. The yield in hearing losses in the total population was 1 in 680, the highest yield we have seen so far as hearing losses are concerned. The reason for it is that we have found a lot of mild to moderate hearing losses. I'm referring only to confirmed hearing losses, not suspected ones, which would

make this yield much higher. The high-risk register comprises 6.7% of the total population. On the high-risk register, the yield is 1 in 40, indicating that we have identified a population where we have to test 40 children in order to find one child with a hearing loss. In actual practice I actually test 1 in 20, because not all the parents return for the follow-up. We have around 50% return, which is too bad. Even with that small return, we are finding a very high yield. PKU screening finds 1 in 14,000. PKU screening is mandatory in 38-40 states. In hearing screening we are identifying 1 in 40. I believe 90% of all the newborn babies in the United States are in mandatory PKU screening. Thus, we are looking at a much better yield in hearing, one to be proud of. This is the kind of program that should be made mandatory, rather than one that finds 1 in 14,000. There's another disease screening, C.I.D. (combined immunodeficiency disease) that finds 25 in 3 million, and yet people are trying to get legislatures to mandate screening for that small yield. In our study of the profound severe losses, two were caused by prematurity, one was caused by maternal rubella. This child was deaf-blind, not totally blind, but fortunately was not much involved other than the blindness, deafness, and heart condition. Our recent findings show that not as much brain damage occurred as did in previous rubella epidemics. Hopefully, the rubella virus will not be so virulent as it was. Prematurity, cleft palate, hyperbilirbuinemia, family history, and ENT abnormality are the kinds of problems we are finding when we do a high-risk register. Many of these children have other problems such as mental retardation, brain damage, and physical problems. So a high-risk register identifies problems other than hearing losses.

Let's look at the clinical entities and at how our knowledge of them helps us to diagnose and place children better. A histopathological slide of a person who had had meningitis (courtesy of Dr. Lindsay) shows a cochlea that has been infiltrated by the meningitic bacteria and has turned to bone, so here we know that when bacteria infiltrate the cochlea, there may be no hearing at all. Other histopathological studies have shown that the nerve itself has been damaged and completely disappears. This is the kind of ear Helen Keller had. She had absolutely no hearing. She also became blind. Always remember when you feel discouraged when you are dealing with a deaf-blind child who seems to have normal intelligence or normal possibilities not to be discouraged if you don't get good speech and language from that child if this condition existed since birth. Remember that Helen Keller had two years of normal hearing and normal vision during which she developed a basis for normal language. Without that she could not have

developed the kind of language that she had and the kind of understanding of language. There is a whole evolution of difference between the child who is deaf and blind at birth and the child who becomes deaf and blind from meningitis as Helen Keller did at the age of two.

Another slide shows the nerve destroyed in meningitis. Even if the whole cochlea isn't destroyed, the neurons are. Sometimes in meningitis there is residual hearing, but when that occurs the otologists think there may not have been any bacterial invasion. The otolaryngologist speculates that the hearing loss may be due to something else that is part of the disease process. It may have been the high fever, it may have been due to ototoxic drugs, or something like that.

In congenital syphilitic infection the hearing loss may be sudden and severe, and when there is any deafness at all in congenital syphilis we know that the discrimination is very poor. I have seen 50 dB hearing losses with zero discrimination. The reason is that the discrimination falls because of damage to the neurons.

Viral endolymphatic labrynthitis is caused by maternal rubella, measles, and mumps. That virus actually gets into the ear, and a child whose mother had rubella may have the rubella virus in his or her system at two years of age, perhaps even older, and we speculate that it might also remain in the inner ear. That virus may stay in the inner ear up to 8 to 10 years of age because we have seen rubella children who have had a progression of hearing loss at ages as old as 8 to 10 years of age. We know that rubella can cause a hearing loss after birth because there have been several documented cases. Not only have we had two very well-documented cases of babies with normal hearing at birth but who developed a hearing loss due to rubella within the first 18 months of life, but Dr. Mencher in Nova Scotia reports that he has some five or six children who, following the rubella epidemic were normal at birth but developed a hearing loss later in life. This kind of child must be followed very carefully. In rubella residual hearing may be present, and good discrimination may be possible. An audiogram of a rubella child shows this. The child was identified at eight months of age; binaural hearing aids were applied to him, and his audiogram at the age of five shows that for bisyllabic words with his hearing aid he understood 100%, and on an adult discrimination list he could get 34% of monosyllabic words. His language level was at his age level. He was really doing very well and his speech was intelligible. The interesting thing is that this was a true bone line, well above the air line. His discrimination was too good for this profound a deafness. The

hearing level goes way down to 120. We couldn't even measure that until we put him on instrument that went up to 125. We thought he just had fragmentary hearing at first at those low frequencies. We finally found out that he really had hearing across the speech range. The air-bone gap in rubella cases was confirmed later when we had a rubella baby who died at about three months. We had tested the baby's hearing and found he had about an 80 dB hearing loss. The temporal bone study showed that there were the typical rubella indications in the organ of Corti, in the end organ of hearing. There were some hair cells left. But what was really interesting was that when he looked at the stapes bone, the otolaryngologist said that there was cartilaginous fixation of the stapes that would have caused a mild conductive hearing loss. Those of us who deal with rubella children are finding that a large percentage of the rubella children must have a congenital anomaly like this. I have one rubella child who has no sensory neural hearing loss at all. He has normal bone conduction and has nothing but a middle ear anomaly. More and more we are realizing that many rubella children may have a conductive hearing loss on top of a sensory neural hearing loss, which, of course, really gives much better prospects for this child to develop speech and language through the hearing aid. We want to emphasize the hearing aid and auditory training with such a child. So even with a lot of other problems present in rubella children, there is a good chance that these children can develop good auditory perceptions with the hearing aid. So give them every chance to develop. Train the hearing with the hearing aid. Sometimes this kind of middle ear anomaly will show up on an acoustic bridge as a very low compliance, but it may not. It may show up normally, but if we look at some other indications on the impedance bridge, the static compliance may be very low.

Let's look at chromosomal abnormalities. I don't think many of you deal with trisomy 13 and 15. These children usually don't live very long, but there are some in state schools. They can have either deafness, sensory neural deafness, or conductive hearing loss. We have quite a few temporal bones of these children and our otolaryngologists know what the pathology is.

Trisomy 18 is a little more interesting because the deletion of the long arm of 18 is one we will see. Trisomy 18 itself is severe like the 13 and 15 Trisomies, but you may not see these children because they expire too young. Let me show you a deletion of the long arm of the chromosome 18. We have a series of about eight of these children now. It had been thought that because it was a Trisomy 18 variation

that these children were all mentally retarded. It turns out that these children actually have middle ear anomalies. All of our series have middle ear anomalies with a conductive hearing loss of about 50 dB. The typical face is a kind of dish face, a large forehead, and low-set ears. A variation in ears in the pinna usually indicates a conductive hearing loss, particularly a middle ear anomaly. Because we fitted a hearing aid on this child at the age of 13 months, this child is functioning at her grade level. That is, she is functioning as a C student, so it isn't necessarily a fact that all of these children are going to be mentally retarded. If we can identify the hearing loss young enough, we can really do something about it. As I will show you later on, this is also true of another syndrome.

Trisomy 21, called Down's syndrome or mongolism, often is accompanied by middle ear anomalies. In a study of 100 cases of Down's syndrome, we found middle ear anomalies in 40%. Their small external ears and auditory canals are indication for suspicion for a middle ear anomaly. Temporal bone slides of deceased Down's syndrome children who had conductive loss show an anomaly of the ossicular chain. Down's syndrome children are particularly subject to middle ear infections, and one of the problems has been that those middle ear infections have masked the fact that they also had a basic middle ear anomaly. They are very mild conductive losses; I have rarely seen them over 40 dB. One always thinks this hearing loss can be cured by medical treatment--myringotomy tubes--so these children go through all of this constant treatment, month after month, year after year--when actually on top of the otitis there is a middle ear anomaly. One must see every Down's syndrome newborn and do hearing evaluations, and one should put hearing aids on these children. As you know, Down's syndrome children have a lot of potential, and if they have a hearing loss at 40 dB, that potential can be realized through amplification. This is not to say that we don't see Down's syndrome children with sensorineural hearing losses. On the contrary, we do see them but it is rare when you compare it with the number who have conductive hearing loss. I urge you to have all of your Down's syndrome children evaluated very carefully for middle ear anomaly. They will do well with hearing aids.

Let's look at a very important category: congenital middle ear anomalies that are inherited as a dominant genetic characteristic. This is called the First Arch syndrome--Treacher Collins syndrome; also in Pierre-Robin syndrome, but we also see it existing almost in isolation. The pathology can be a fixed footplate, isolated ossicular anomalies, absence of the oval window, inner ear anomalies, sometimes sensorineural hearing loss, and abnormalities of

the pinna or auricle. Usually the function is that they have excellent discrimination with the hearing aid because this is a conductive hearing loss. We want to look for these children. Treacher Collins syndrome is a severe manifestation of First Arch syndrome: anti-Mongoloid slant of the eyes, protruding jaw and poor teeth, the very low-set ears. Whenever one sees low-set ears, ears that deviate in any way from the normal, one looks for a possible middle ear anomaly. One of these children expired at the age of two months, and the audiogram that we made at two months of age shows a complete conductive loss. We were able to get his temporal bone, which showed only one ossicle, one in the middle ear--what we call a columellar stapes, which is like birds have. This one isn't even connected with an ear drum, so this child would have a complete conductive loss. There is also atresia of the ear canal, so that we know he would have had a conductive hearing loss, but this child would have had normal hearing with a hearing aid. It's our policy to put a bone conduction hearing aid on a child with atresia by one month at least, even three weeks, if there's no other problem at the time. We believe that these children should have the benefit of normal hearing almost from birth. They do very well with aids--at least achieve their potential. Some of these Treacher Collins children are mentally retarded; some aren't.

Another kind of ear is a sort of elfin-like ear that deviates from the normal. This child had middle ear anomaly. It happened to be a rubella child who had both a sensorineural loss and a middle ear anomaly. He really didn't have much hearing at this point.

Another ear shows an atresia and a very odd-shaped kind of an ear. Any deviation from the basic line of the ear and from where the ears are located on the head may indicate a middle ear anomaly. A child with a malformed ear may have an atresia and a conductive loss. The other ear may be normal, and may look perfectly normal, but don't depend on that apparently normal ear's being absolutely normal. That ear in 50% of the cases also has a middle ear anomaly. If one ear has an atresia or middle ear anomaly, the other ear must be tested because it may also have middle ear anomaly. With these middle ear anomalies, particularly in the kinds of children that we work with, we won't get them to their potential function unless we take care of this conductive problem. It will make this child trainable, who wasn't trainable before, or it may make a trainable child educable, which makes a real difference.

A middle ear anomaly may show up on the acoustic bridge as a flat tympanogram. We would expect this with the Down's

syndrome child where the incus was enlarged and the ossicles just weren't moving very well. You'd also expect low static compliance and in this case, no stapedial reflex.

Let's go to connective tissue disorders, osteogenesis imperfecta. These children are usually perfectly normal mentally, but they have some very severe physical problems. One of them is that they may have a stapes fixation likened to otosclerosis, but they also may have sensorineural loss. We have seen some sensorineural hearing losses, but in every case they have had very good function with a hearing aid. These children should be fitted with a hearing aid if they have any hearing loss at all.

There's another connective tissue disorder called Hurler's syndrome, or Hunter's syndrome, or Hunter-Hurler's. Some of you may be working with this kind of a child because many of them are mentally retarded. However, many of them may have collapsed cochlear ducts which would cause a sensorineural hearing loss; they might have conductive loss due to chronic otitis media or a ossicular malformation, but we have found that they do very well if you fit them with a hearing aid, even when they have sensorineural hearing loss.

The typical Hunter-Hurler's syndrome has low-set ears, a saddle nose, the offset jaw. Yet such a child, with this degree of hearing loss, may do very well and keep up at grade level in school. Such a child with a hearing aid does very well, 80% discrimination, with a hearing aid. But it should be found in the first year of life.

Then there are skeletal defects that are pretty obvious, for example, Klippel-Feil syndrome. The typical Klippel-Feil child has an absence of the cervical vertebrae, viz, the head just looks as if it's sitting on the neck; there are no neck bones. Obviously it is a skeletal abnormality--a bone abnormality. And the ossicles are also malformed. There is malformation of the ossicular chain, but in addition to that, there also can be a very severe sensorineural deafness, and indeed one of the reports of temporal bones has shown that there is nothing at all in the cochlea, no sensory nerve endings at all, no organ of Corti, nothing in the cochlea. These are the kinds of things we are led to expect from skeletal disorders.

A syndrome was identified in our hospital by Dr. Stewart and Dr. Bergstrom called Hand-Hearing syndrome. This child had very abnormal joints in her hands and her feet and was profoundly deaf--profound sensorineural deafness.

In deafness from the Rh factor, usually it's been our experience that if there isn't any brain damage, they do very well, because they have moderate neural hearing losses and with a hearing aid, they do beautifully, particularly if fitted with a hearing aid when young. Such a child was fitted with a hearing aid at 18 months, went through school in advanced classes in a regular school, now has her master's degree as an audiologist and a deaf educator. A beautiful young woman. She had a little bit of motor damage, and is one of those wonderful success stories that you hope always will happen.

Waardenburg syndrome is a dominant inherited deafness syndrome. The two characteristics in such a deaf child are that the medial canthi are displaced--the eyes look wide-spaced, and whenever there is deafness, they always have the displacement of the medial canthi. However, a lot of them have a wide-eyed look but don't have the deafness. The second characteristic is a white forelock. One report of the temporal bone pathology of a Waardenburg syndrome shows the organ of Corti to be totally destroyed, and there is no hearing at all. This is not always true. Some reports of Waardenburg's do show quite a bit of hearing left. but we know what can happen in Waardenburg's because we know that the otologists report on the one bone. The hearing loss only occurs in a small percentage of people who carry the Waardenburg's dominant gene. Another example of an ear that may be hereditary is a Michel ear, where the cochlea has not formed at all. A polytomogram of that kind of ear shows nothing but bone in place of the cochlea. Yet this child is a perfectly normal child otherwise, normal in intelligence, but has no hearing at all. It's very useful to know these things because certainly in contra-distinction to the rubella child to whom you really want to give good auditory training, you certainly aren't going to depend on a hearing aid for any language input into this child. What have we done with this child? We've still got a hearing aid on her because originally, when she was about a year old, we put a hearing aid on her. When we saw the polytomogram we changed it to a bone conduction aid. She likes it; she may be getting something from it. With the children now that we think may have no hearing, we're putting bone conduction receivers on because we think that will give them a little bit more awareness. The eardrum may be vibrating and they may be getting some tactile responses that do help. I wouldn't deprive any child of a hearing aid.

Another malformed cochlea is called a Mondini ear, very common in hereditary hearing losses. There is only

one turn of the cochlea. I just wanted you to know that there are ways that we can tell when there is this kind of very severe damage to the ear, and we really don't expect very much hearing in a case like this.

I hope I have demonstrated to you how we can be helped by all the research knowledge we can get and from diagnosis as early as possible on these children.

Management of Hearing Loss

There have been some revolutionary changes in the way we look at screening programs. Years ago the famous Pittsburgh study by Eagles, Jordan, and Doerfler showed that a 25 dB hearing screening level would miss over half of the children with ear disease. What we are realizing now is that a 25 dB hearing screening may miss large numbers of children with significant hearing losses of 15-25 dB average. The reason we are all pushing tympanometry for public school screening and infant screening is that 15 dB hearing loss from serous otitis media is a handicapping one. It's a matter of the nature of the speech sounds. All the vowel sounds of speech have a great deal of speech energy in them, like a, e, i, but the unvoiced consonant sounds of speech like s, p, t, th, and k are not even heard. Many of us don't need to hear them in rapid conversation because we have learned the contextual kinds of clues and the strategies that fill in for those sounds that we miss. We don't even know they're not there. But the child who is beginning to learn these sounds and their relationships has to hear every sound to learn completely. A child who has a slight hearing loss due to recurrent otitis media as a very young child will have mild to really significant auditory learning disorders.

Children who had otitis media in the first two years of life, even if they have only a 15 to 20 dB hearing loss, are the children who turn up later with auditory language learning problems.

About 27% of all children will have otitis media in the first year of life, and in many it will reoccur. One pediatrician, Dr. Howie, said that if a child has otitis media in the first year of life and you know that when he or she is 8 years old, she/he will still be having it. He calls it the "otitis-prone" child. He followed a group of children in his practice, 500 children in 8 years, and found the children who had otitis in the first two years of life, beginning in the first year, had a significantly lowered IQ test.

My criterion for a handicapping hearing loss is otitis media more than half the time for six months. The otitis media is ipso facto evidence that the child has a hearing loss, and if the child has it more than half the time over a period of six months, she/he has "a significant hearing loss." The acoustic bridge is the only way to catch otitis media in young infants, other than having a pneumatic otoscopy examination by a physician. That is why 0 to 15 dB is considered normal, with reservations. The reservations are because I can show you hundreds of children with hearing at 5 dB--quite normal range hearing--who have serous otitis, perforation of the eardrum, monomeric membrane, or tympanosclerosis. This is authenticated by many files.

What can be heard without amplification at 0-15 dB? All speech sounds presumably, but possibly as you get 10 to 12 decibels, these children may miss some of those high frequency consonant sounds that are very important, or they might not come in as fully as they should. The degree of handicap? We say little or none. If we're going to be arbitrary we can say we've agreed that 15 dB is a significant hearing loss in a child. I say we mustn't be quite that rigid about it, but let's say that 15 dB does indicate a beginning hearing loss. With a 15 dB loss we can have all sorts of middle ear conditions: serious otitis, perforated eardrum, monomeric memory, sensorineural loss, or tympanosclerosis. What can be heard without amplification? The vowel sounds always are heard well with a slight hearing loss. But the unvoiced consonant sounds may be missed. As the child gets older she/he hears words with consonant blends that are very difficult to understand. The degree of handicap here is a mild auditory dysfunction in language learning, if there is no intervention. Enough studies have demonstrated that this is true. The child with a 15 dB hearing loss has lowered scores on the ITPA on all the auditory skills and high scores on all the visual skills. The auditory skills may be a little lower than the visual skills, but the gap will become wider and wider, depending on both the frequency of the attacks of otitis in early life and the degree of loss that results. There is always a subtle gap between the auditory and visual skills, but it can be very wide, like the difference between 2 years and 8 years: auditory scores at 2 years of age and visual scores at 8 years of age for a 6-year-old child. A child may pass every school's screening test at 25 dB and yet the difference between his or her auditory and visual skills is 2 years for auditory and 8 years for visual when he or she is 6 years old. These children do not have perceptual problems, do not have central problems, because we can rule those out. There are functional auditory learning problems caused by this very mild hearing loss.

With such mild auditory dysfunction one should consider the need for a hearing aid. We have been putting hearing aids on infants in their first year of life, very mild hearing aids with a maximum power output of no more than 100 decibels. Half of this group is completely successful. Mother is pleased; the baby just loves the hearing aid--grabs for it upon waking. The other half is not successful. I think it depends on the mother's real involvement or investment in this program, or her conviction that an aid is really needed. If the mother isn't really sold on it, she won't put the hearing aid on; as a result, the baby won't like it. The baby reflects her attitude.

The alternative to a hearing aid for a baby is a program of increased auditory stimulation in the home. These early language intervention programs are marvelously useful for the normal child too. As a matter of fact, several programs developed for the deaf child are now being used for normal children or for any child who has an "at risk" category for language communication development.

Remember the point that these children are all on a continuum, so that you're applying what is good for a normal child to the handicapped child. If you can't put a hearing aid on an otitis-prone child or if there is some problem in getting a hearing aid, then I would institute a vigorous home training program of increased auditory and language stimulation. It's hard for us to say: here's a child with a 15 dB loss and recurrent otitis and she/he needs an aid. Nobody can see that the child isn't hearing well. That child is responding beautifully and yet has a very subtle hearing loss that will cause problems later. So you have to act on blind faith and just say that otitis media is presumptive evidence of a hearing loss. This is a good preventive program.

If the child is older and is in school, you would want to give lipreading, auditory training, and speech therapy in addition to a hearing aid. We let the child try the aid for three months. Then we have a conference with the teachers and the parents to ask them if it helped.

Now let's speak about the 25 to 40 dB level, which is a mild hearing loss. The same kinds of middle ear disease can be present, plus sensorineural hearing loss. Without amplification this child hears only some of the speech sounds--the louder voiced sounds. This child will have auditory learning dysfunction, mild language retardation,

mild speech problems, and inattention in school, if there isn't intervention. She/he should have a hearing aid in every instance, with the usual aural rehab which includes hearing aid orientation.

From 40 to 65 dB is a moderate hearing loss. This is caused by more severe middle ear diseases like chronic otitis, which is defined by a perforation and a chronic middle ear infection and drainage. A middle ear anomaly includes atresia, in which there is no ear canal at all. In a middle ear anomaly such as is often found in Down's syndrome, the loss may be only 35 to 45 dB. This can be an anomaly of the ossicular chain. In more severe middle ear anomalies there may be no ossicles at all and yet the ear may look perfectly normal.

With such a loss the child misses most all of the speech sounds at a normal conversational level, and the handicaps will include speech problems, language retardation, learning dysfunction, and inattention. She/he needs all of the above rehab measures plus consideration of a special classroom situation. Placement depends on the individual child, on his or her intellectual ability, and on how much training she/he's had already. A child with a 65 dB hearing loss who has had amplification almost since birth, will function beautifully in a regular school. If this child wasn't found until age three or four, it's doubtful whether he or she will ever catch up, which may require a special classroom situation. Many things are important in evaluating whether he or she needs a special classroom.

Sixty-five to 95 dB is considered a severe hearing loss, and the condition is a sensorineural loss or a mixed loss that's due to a sensorineural loss plus middle ear disease. A hearing loss of more than 60 dB is no longer considered a conductive hearing loss. If I were to cover your ears completely, I couldn't give you more than a 40 or 50 dB hearing loss. A child who has no middle ear at all, an atresia with no ear, no ear canal, can't possibly have more than about a 65 dB conductive hearing loss. The reason is that over about 65 dB the sound waves begin to vibrate the whole skull case. It's almost like a bone conduction receiver, with the sound getting into the hearing nerves. So if you have normal hearing nerves, you can't possibly have over a 60-65 dB conductive hearing loss. A conductive hearing loss plus a sensorineural hearing loss is called a mixed loss. It happens in the 65 to 95 dB range. This child hears no speech sounds at all in normal conversation. When you get over 65 dB loss you don't hear speech. The handicap with a 65-95 dB loss is severe speech

problems, language retardation, learning dysfunction and inattention, if not treated early. The child needs all of the above rehab measures, plus probable assignment to special classes.

I know you're working well with children, but you must work with parents, too. I really think that we have to understand some of the problems that parents go through, some of the things that you and I don't look at. This is very true of me. I had to learn this the hard way, by making mistakes. Our attitude toward the parents is very, very important. We can foster a destructive attitude in the way we deal with parents. You will see parents who deny the fact that their child has a handicap and will keep shopping around from clinic to clinic. The way we deal with parents causes this behavior. Some of us use a hit-and-run approach in telling about the child's problems. We tell the bad news and then we get out, because we can't bear to relate deeply to the parents.

Sometimes we can't bear to listen to their reactions, so we use the "rose-colored" glasses approach. We say, "Everything's going to be fine. This child's going to have training. He's going to be fine." Nothing could be farther from the truth. This child may never be normal, but we just don't want to talk about it.

Then there's the constant talking and the action approach. We have to talk about the problem and be very, very academic about it: we'll do this and we'll have this training and we'll do that. And we never give the parents time to air their feelings. Did you ever listen to the parents and find out how they feel about it? Let them ventilate their feelings about it? You will be surprised at how much anger and hostility you will find. You're going to have to be ready for that. You will have to look at yourself and say, "Can I take this?" You should be able to take it, because it isn't directed at you. The anger is something that comes from the parents' feelings of guilt and anger about having this child. There's a lot of depression. They have to go through a period of mourning. This is just like a death to them. They have to mourn the death of their normal child. So think of it in those terms, that you're really dealing with a bereaved parent who has lost a normal child and then perhaps you'll be a little more sympathetic.

Let them ventilate their feelings. Ask them, "It must be very hard to suddenly find out that you have this child that's going to be a real problem." Then listen. Let them get out their feelings; they may have feelings about you; they may direct them at you. That's all right. You can take it.

Explore how you feel about being able to handle this thing. Think of it in terms of mourning--that you're dealing with a bereaved parent. Remember they go through the same stages: denial, anger, and finally acceptance. Another thing to avoid is bargaining, where suddenly they say, "all right. You do all the work then." These parents have to do some work themselves; they have to face this--to plunge in and help this child themselves. You can help them in many ways. First, listen to them with great empathy. Let them ventilate their feelings. If you don't know indirect counseling, learn a little bit about it, just sit there and let them air their feelings and give them a little feedback.

Tell them the things they're doing that are good: e.g., say, "Look, you always turn to the child and have him look at you while you are talking and that's very good. That's the way you should deal with the child who has a hearing loss."

Tell them about all the resources that are available in the city. Give them an awareness of the process that the child is going through and most importantly, examine your own feelings about how you deal with other people's feelings. It's terribly important to think about yourself as a part of this drama that's going on. There are many ways that we can help educate parents. We can do it in groups, we can use older parent involvement, and if you feel that psychological and psychiatric help is indicated, don't hesitate to encourage this. Tell them, "If you really feel badly, it you really feel you can't handle the problem, counseling is available."

Give them some information about the audiograms. They should have some education about what an audiogram means and what hearing loss is. Also give them some disciplinary help.

Another thing that we believe in is that the parent has to participate in the program planning. The parent is not going to be effective with the child unless he or she has a stake in the child's program. This is, we show the parents the different kinds of programs that are available and let the parents make the decision as to what kind of program they want for this child. Let them decide. You may limit the choices and you may very cleverly guide the child into one program or another by very subtle means, but let the parents feel that he and she have made the program choice. This is particularly true of a deaf child, where there is a choice of programs. In our community we have a choice of three or four different kinds of programs

for deaf children, and all the proponents of these programs think they are the best ones, of course. We have the parents go to each clinic and go to an acoupedic program, an oral program, a total program, and a manual. Then we get together with them and say, "Well, what do you think? Which one did you feel, in view of these facts about your child, is best for him?" It's amazing how well they will choose and what an intelligent decision they usually will make about their child. The nice part about this is that once they have chosen the program, they go into it wholeheartedly. But they are also willing to change, if it's found that this is the wrong program. They're quite flexible about changing and they don't blame anyone for anything. That relieves you from the backlash.

Involve the whole family in the parent-child home training program. If it's a total communication program, everybody has to learn sign language. It won't work unless everybody participates. You teach signs naturally through role-playing with the kids; everybody learns it along with the child. You must use your judgment about where to start the child in the program. Suppose you have a three-year-old child who has just been identified. You won't start him or her at the three-year-old level of this program, and you can hardly start him or her at the birth level, which begins with bathing and diapering. You will have to use your judgment about the kinds of things you will use in the home training program. The parents are given many activities to do around the house. We don't want to make therapists out of the parents, but rather to teach the parents how to use their daily routines to stimulate the child. Some parents are nonvocal. They just don't talk very much. That is a sad thing for a child who needs a lot of language stimulation. You've got to get those parents to be vocal, for the first time in their lives. You have to teach them to say at feeding time, "Are you hungry? Here's your bottle. MMMM, that's good." (Normal parents do this all the time, but not all of them are vocal.) "Open your mouth. Now chew your pears. Oh, you're sloppy. Let's wipe off your mouth. Look at that dirty mouth. You're all finished. No more. No more. You're all full." You actually teach the parents what to say while they're feeding the child. I know it sounds incredible. Yet for some reason the parents of a handicapped child cut off communication the minute they know the child is handicapped. You'll find the mother of a deaf child who knows the child's deaf. Before she's had training she never opens her mouth to that deaf child; everything is done in pantomine; she just cuts off verbal communication completely. In degree of handicapping condition there is a breakdown in communication of some degree and that's why some very simple things have to be actually taught to the mother.

During dressing time: "Oh, you're dirty. Now let's change the diaper. Take out one pin and then the other pin. Here's some powder. MMMM, doesn't that smell good?" Somebody has to actually see that they're doing it. That's the advantage of some programs like the Denver Project Child Program where they used videotape. They actually taped the parents while they were doing these things, and then they sat down with the parent and watched the videotape and said, "You were doing something interesting there. Why weren't you talking about it? Here you were doing something interesting, yet you never opened your mouth about it." It really shows the parents what they're doing and not doing. As the child grows older, parents take a more active part in his or her daily routine. "Now, open the jar. Take the top off. It goes round and round and round. Now take out two pieces. Spread the peanut butter. Oh, your're spreading the peanut butter." Dressing time: "Here's your shirt. Put one arm in. Now the other arm. Get your pants. We need your sock." You can use these kinds of programs and plug into the child's particular needs at any age. We always say that a deaf child who was identified at two years of age becomes a birth-age child when you first put the hearing aid on, and his or her hearing age stems from that time. She/he is "born" from the time that hearing aid goes on, so far as auditory development is concerned. So you have to recapitulate normal development with this child who is now learning for the first time. You must know the normal development of the child; you have to know that it takes a full year of input, constant auditory input, before a child comes out with one word and begins to talk. That's the same kind of time schedule that we will expect for a child who has a hearing aid. A very bright child who gets a hearing aid may traverse that full year in perhaps four months and begin to talk. With a child who is mentally retarded, it takes a lot longer. The time clock depends on the degree of the handicap and whether he or she has other handicaps.

All of these language stimulation activities are things that normal parents do; they aren't just new training procedures. The natural, normal parent, when he or she has a child who puts out the "attractive" signals, is going to react to them and begin to talk to and stimulate the child. But the parent of a handicapped child doesn't do that because the child doesn't send out those signals; the child isn't normally warm, cuddly, smiling, cooing, and attractive to the parent. There is not the same eye contact. All of these things normally inspire the parents to give the warm, nurturing kind of mothering that a child needs. Remember that in the normal child, warm and nurturing experiences are through the auditory avenue--through the mother's voice, the mother's step, the sound of the bottle. All of these things are perceived auditorally. Therefore, deaf or handicapped

children need so many more tactile and visual kinds of experiences to make up for the warmth that they are missing in the auditory field. This is the reason for all these programs to teach mothers to be vocal.

I hope I've pointed out the things we have to teach ourselves as clinicians, to relate to the parents' feelings. Once we've done that, we can really be supportive of the parents and help them do the kind of nurturing the child needs.

Marion Downs
Assistant Professor
Department of Otolaryngology
University of Colorado - Medical Center
Denver, Colorado

The preceding is a transcription of a presentation not a formal paper.

AUDITORY PERCEPTION AND TRAINING

Honey Weiner

Gardner (1975) defines hearing as "the cortical interpretation of sound impulses" (p. 223). Educationally, the concept of "hearing" implies more than the measurement of specific auditory sensations. According to Whetnal and Fry (1964),

> The term 'normal hearing' does not merely mean that a sound is audible, but includes the detection, recognition, and interpretation of the meaning of sound. Hearing in this sense is not present at birth but is a skill dependent upon learning. (p. 1)

The hearing mechanism itself is fully developed at birth, but the ability to listen is dependent upon the maturation of the nervous system. Kellen (1975) describes some of the maturational aspects of audition:

> Although the auditory mechanism is fully developed at the time of birth, the infant's capacity to respond to sound seems to be limited to reflex or startle reactions. Not until the infant is two or three months of age has sufficient maturation of the total nervous system been achieved so that higher, more complex auditory functions can be incorporated more voluntarily. Only much later does the child attain the maturity to make fine auditory discriminations and to achieve other aspects of mature auditory behavior. (p. 6)

Kellen points out that the hearing mechanism does not mature, but the ability to listen, along with other integrative processes, does.

Kellen also discusses sensory perception and the levels of perceptual processing. He notes that learning begins with sensory experiences. Part of the sensory experience is based on what our bodies can physically receive, and part is based on what our brains acknowledge as received. "The basis of cognition is perception, the ability of the central nervous system to attend to and initially decode sensory information" (p. 4). At this level,

> The processes of selective attention allow the central nervous system to focus on relevant stimuli and differentiate them from other data simultaneously received,

> processes often referred to as involving figure-ground selection. (p. 5)

The next level of perception is perceptual organization; at this level, attended stimuli are patterned and modeled. The ability to make discriminations involves patterns and relationships between stimuli; the auditory discrimination between two similar words that are spoken requires auditory organization and would occur at this level.

The final stage is perceptual recognition, the integrative process. This requires the ability to integrate discriminations and to compare them with previous experiences, and it involves the storage of information by the central nervous system. "If the process employed to perceive a stimuli recognizes them as unique, the CNS stores the information; if the processes are recognized as duplications of earlier stored perceptions, the stored data are intensified"(p. 6).

The development of the ability to discriminate has important implications for learning to listen. According to Sanders (1971), the maturation of the central nervous system in the child results in an increased sophistication for processing sensory input, and there is an associated increase in awareness of complex stimulus patterns; this gives rise to a rapid growth in the ability to discriminate.

> As soon as an organism becomes aware that an incoming stimulus differs from those that have already been experienced and internalized, internal representations are restructured so that the new stimulus complex is incorporated into the individual's experience and given meaning. (Sanders, 1971, p. 104)

Sanders notes that during the beginning stages of auditory perceptual development, the child develops an awareness of sound, which results from an ability to internalize auditory stimuli and then integrate them with other sensory stimuli; a relationship between the child and the sound source is established within a context. The example given here is that the mother's voice is recognized first within the context of her physical presence--her visual image, the sensation of her body. Later, the auditory cue alone will provide sufficient information for the recognition of "mother." The child then learns to discriminate between sounds and sound sources. The initial discrimination is whether "it is" or "it is not" mother. As the child has increasing contact with other sound-generating people and things, s/he must make internal representations of the sensory cues to the new experiences. "The child's auditory world may consist of mother, father, squeaky toy, and several sounds in the 'none of these' category. The number of internalized sound patterns and associations grows rapidly in the first year of life as the child becomes auditorally oriented" (Sanders, 1971, p. 105).

The factors involved in learning to discriminate between gross sounds may be summarized as follows (Sanders, 1971, p. 106):

1. Awareness;
2. Repeated exposure to sound within a context;
3. Predictable association of the acoustic stimuli with other sensory stimuli arising from the same sound source;
4. Internal representation of auditory and other sensory impressions;
5. Multi-sensory recognition of sound-generating objects;
6. Identification of a sound source on the basis of its acoustic characteristics alone.

Assessment: Auditory Processing

Topp (1977) describes central auditory processing as the "reception, analysis, and integration of auditory material within the central nervous system" (p. 490). She describes an auditory processing model based on four levels of function. This model is a useful one for evaluating the performance of individual children, as well as for establishing expectations for the development of processing skills. The model reflects the specific levels of function and also indicates the constraints of attention and memory in the functional hierarchy.

Topp describes each of the four levels of function in processing sound (p. 493):

1. Detection

   This is the most elementary level, and here the significant function is awareness of sound being present. Sound must be above the threshold of hearing in order to be processed. No aspect of the sound's meaning is discerned at this level.

2. Discrimination

   At this level the central nervous system begins to analyze the sound and distinguish certain characteristics of it. Discriminations encompass differences in frequency, intensity and temporal features (time differences important for localization). Combinations of these discriminative features may occur, for example, in differentiating foreground from back-

ground noises. The sound is singled out as separate or different from other sounds in some way(s).

3. Identification

The sound is further analyzed and is recognized in terms of its relationship to past sounds heard so that aspects of cognitive meaningfulness are associated with it. This is the level at which, for example, a single word is recognized as meaningful and having a certain significance to the listener.

4. Comprehension

Recognition or identification is sustained over a period of time. It is here that the final stage of integrating with other information in the central nervous system occurs. The relationship of one word to other words is the important feature at this level and involved the rules of learning and using language.

Attention and memory affect the development of auditory skills at each level. "Attention may be considered at two levels - reflexive and cognitive" (p. 494):

> The reflexive refers to the constant alertness of the nervous system to incoming stimuli... Evidence for this type of attention is found in the phenomenon of hearing sounds without being aware of listening and the inability to voluntarily turn off one's hearing completely. Cognitive attention implies conscious awareness of focus on incoming stimuli that occurs, for example, in voluntary listening when one is motivated to listen. Attention is a significant factor at all levels of function in the auditory system, from detection through comprehension.

Memory is considered in terms of short and long-term storage of information. Memory affects auditory function at levels beyond detection; at the level of discrimination, memory is short-term, and at higher levels memory is long-term.

When evaluating the auditory functioning of deaf-blind children, we must consider how the child is able to use the residual hearing s/he has. The audiogram itself cannot provide this information. "an audiogram theoretically shows how much hearing an individual has, but cannot show how much an individual hears" (Franklin, 1970). How a child is able to use hearing depends on a number of factors, including

the ability to use the systems necessary for the higher and more complex levels of auditory processing.

Auditory Training

The following characteristics of deaf-blind children have become observed in regard to their response to sound (Groves, 1971):

1. "Too deaf to be deaf" phenomena even if the child has good measurable residual hearing. Robbins (1960) notes that the problem here may be in interpreting what is heard, and reacting appropriately to sound.

2. Deaf-blind children tend to be more overtly responsive to visual stimuli than to auditory stimuli. Some explanation of this can be attributed to the type of hearing loss, damage to the brain in auditory and integrative areas, lack of experience or skill in learning to listen, and the general lack of experience with the environment.

3. There is a tendency to adapt to new sounds after several presentations of that sound. The impression one gets is that the novel sound stimulus has been adapted to by the child, and the sound stimulus must be changed in some way in order to regain the child's overt recognition.

4. In initial auditory training periods, the child may not respond overtly to the input. One must remember that the child must listen for an extended period of time before s/he responds.

Robbins (1960) defines goals in intellectual activity that are necessary for the child in order for him/her to make maximum use of his/her potential. The following are prerequisite behaviors to be considered before considering an auditory training program, based on the behaviors described by Robbins:

1. Ability to direct attention; more than fleeting attention is necessary at the higher levels of auditory function.

2. Goal-directed, purposeful behaviors.

3. Ability to imitate briefly upon request (many auditory training techniques require imitative behaviors).

4. Remembers simple things, e.g., routines, locations of things, ways of handling certain objects.

5. Simple problem-solving, e.g., opening doors, finding dropped object.

6. Displays curiosity; is active rather than apathetic.

7. Self occupation for periods of time is self-initiated and constructive.

Motivation is an important consideration for auditory training. The desire to be active, to learn, must be present for learning to occur (Robbins, 1960).

The degree to which a child will learn to use her/his residual hearing will depend on a number of factors, including the nature and amount of residual hearing, and the intellectual, perceptual, and cognitive factors which will define the ability to integrate and interpret auditory information. The intactness of the central nervous system, as well as those areas of the brain that are responsible for organizing and processing sensory information, are important considerations. The degree to which a child may be able to use audition, based on all of these factors, can be evaluated along a continuum:

Not at all	recognize presence of gross sounds	listen to interpret speech

Training itself is an important variable in defining the goals of expectations for individual children. Children must be taught to respond to sound; they must learn to listen. Auditory training does not mean what we expose the child to sound, but implies a systematic process of teaching the child to respond to auditory information. Barrera (1975) states:

> The deaf-blind child does not spontaneously use his senses to their maximum capacity, so that how he functions auditorally may be at variance with how he could function considering how much hearing he has intact. Deaf-blind children may function as totally deaf, or totally blind, not using the residual hearing or sight they possess. Yet, once systematic intervention is begun, the child may begin to respond to auditory stimuli. (p. 9)

When teaching the deaf-blind child, the instructor must be sensitive to the ways in which s/he reacts to the child, and how her/his behavior

is interpreted by the child. Barrera (1975) discusses consistency as a primary need in the active relationship between the teacher and the child:

> A child defines and redefines his knowledge and judgments of reality by bouncing his perceptions from adults around him - he tests the validity of his judgments by behaving in different ways and then observing adult responses. If the adult response frequently appears to be contradictory, the child begins to disbelieve and devaluate his own ability to gauge reality. The deaf-blind child not only tests his reality through adults, but is dependent upon them for providing access to the major portion of the environment (reality) around him. (p. 21)

For the deaf-blind child, then, the role of the adult is a crucial one in learning about all aspects of the world, and the need for consistency is great in directing this learning. However, consistency must be defined from the point of view of the child.

In defining an auditory training program, one must keep in mind that almost every deaf-blind child has some residual hearing, although the degree to which the child can use that hearing is dependent upon a number of factors which have previously been described. Goals for particular children may vary along the continuum from recognizing the the difference between the presence and absence of specific gross sounds in a controlled situation, to attending to and comprehending speech on the basis of audition. The responses that are expected within specific auditory training activities must be within the range of ability for the child, given her/his intellectual, motor, or cognitive limitations.

Robbins (1964) discussed two approaches to the presentation of sound: saturation and structure. Saturation is seen as the creation of a sound-filled environment. "Saturating a child with sound" assumes that the child can listen to and attend to the sound that is being present; it becomes the responsibility of the child to make the appropriate associations and to derive meaning from the auditory information that is provided. This appears to be inadequate as a way of teaching the child about the meaningfulness of sound. Structure of auditory presentation and activities is necessary to this end. The teacher must control the presentation of sound and create a situation in which the child will learn to make the associations between sound and its meaning. The teacher must present activities in a carefully planned way, with consistent expectations for the child. We must teach the child to respond to sound; we cannot assume that the child will learn this through exposure alone.

Using some of the suggestions presented by Robbins (1964), the following considerations should be made in structuring the auditory training of deaf-blind children:

> Control the auditory environment: cut out environmental background sounds which are competitive with the sounds you are presenting, Consider the classroom location and any additional noise factors.
>
> Alert the child to listen.
>
> Establish firm rules of behavior.
>
> Be aware of the possibility of delayed response.
>
> Exercises with sound-producing objects must be made clear-cut; the child needs to know what to pay attention to, what is expected.
>
> The teacher must be aware of what has the child's attention: make the most out of attention if it can be constructive, or redirect attention if necessary.
>
> Be aware of the need for simultaneity. The child needs to have the word or sound presented at precisely the time s/he is experiencing the action or object which the sound represents. The child needs clearly defined associations set up for her/him.
>
> Control the auditory stimuli, including the rate and amount of stimuli.

There are four levels which define specific abilities to be mastered in the progression through the stages of auditory training; these have been described by Karp and Luterman and Pollack (1964). These abilities are not seen as separate sequential steps, but each level continues to operate throughout the development of auditory skills, and each influences and is influenced by the others.

I. Awareness of Sound

Developing awareness of sound requires control over the sound environment. The teacher must provide opportunities for experiencing sound in a controlled situation. At this level, the teacher is developing an awareness of the presence and absence of sound, i.e., "sound vs. no sound." Sounds must be loud enough for the child to

hear, but also must be meaningful and attached to the environment.

A. Call attention to environmental sounds as they occur; seek out the source of the sound to make it meaningful. Set up situations in which the sound will occur, and repeat them.

Use: knock
cough
stamping on floor
heavy object dropped on floor
vacuum cleaner
clapping

Develop curiosity about the source of the sound; use sounds associated with a number of things that occur during the day.

Drop object on floor, let child drop it; call attention to the fact that you hear the noise.

Bring child to household appliances; let the child feel, experience the machine; turn the machine on, then off and indicate when you hear it.

Use record player; stop and start music, and observe any reactions.

B. Noisemakers: use noisemakers child is most likely to be able to hear on the basis of audiological information.

Shake rattles.

Help child bang with a stick.

Bang toys the child is playing with.

Bang blocks on the table as you approach the child.

Stamp on the floor as you approach the child, then tickle the child or swing her/him up.

Pat floor near the child's head as s/he lies on the floor.

C. Use all modalities. Have the child feel vibration; provide direct body contact with the sound source, e.g., put her/his hands on drum or on the teacher's face. Feeling can lead to sound awareness.

II. Attention to Sound

At this level we are trying to develop thoughtful, intentional listening. Goals for this level include:

1. Intentional seeking out of the sound source (reaching, moving toward sound).

2. Interest in making sounds.

3. Beginning of the realization of the meaningfulness of sound; it becomes a tool for establishing some relationship, or interaction with the world.

The following activities are directed at these goals.

A. Begin to move the child away from the sound source; create a limited distance between the child and the sound.

1. Teach the child to reach to the sound source when s/he hears the sound. At first, the conditioning of the reaching response involves manipulation of the child.

2. Child scoots on bottom toward the sound source when it is sounded. The child's moving toward the sound is reinforced by the feeling the vibration or producing the sound, or obtaining the object.

3. Sound noisemakers behind the child, and teach the child to turn and reach for it.

B. Use sounds as signals for beginning activities.

1. Child can be taught some gross motor activity which stops when the sound stops (e.g., jumping, clapping, rocking).

2. Car or toy moves when sound is presented, does not move without sound.

3. Babble sounds as you move or clap, stop clapping when you stop vocalizing.

4. Use meaningful sound, words in play activities, e.g., "push," "pull," "up-up-up," "ba-ba-ba" as object moves.

C. Play localization games in which the child seeks out the sound at increasing distance.

D. The child is encouraged to make sounds; attempts at creating sounds, vocalizations are reinforced. Also allow for periods of silence. Silence not only serves to further exemplify the difference between sound and no sound, but also provides the child with an opportunity to resume activity in sound-making in an intentional way.

E. Provide an opportunity for the child to initiate sound as well as imitate it. As the child is beginning to attend to sound, s/he is told or the idea is conveyed, "I hear you" or "I don't hear you."

III. Discrimination

Discrimination requires the ability to retain sounds in order to make comparisons with other sounds in the auditory repertoire.

A. Gross sounds: develop the association between a particular object and the sound it makes.

1. The child and teacher each have two noisemakers; the child listens to each noisemaker being sounded, and imitates the sound with the appropriate noisemaker.

2. The teacher makes a sound with one noisemaker, and helps the child to find the same noisemaker and sound it.

B. Discriminate the number of times a sound occurs

1. Begin with one sound vs. many: The teacher beats a drum many times, and the child imitates; then s/he beats the drum with a single beat, and the child imitates.

2. Teacher beats the drum three times or once, and the child imitates.

3. Teacher vocalizes three syllables, and the child imitates.

C. Discrimination of differences in vocal patterns

1. Short, staccato sounds vs. prolonged sound; stress the acoustic elements of duration.

--"ba-ba-ba" and "baaaaaaaaaaaaa"

--"up-up-up" and "down" (prolonged)

2. Variations in pitch, stress

ah (rising pitch)

ah

"meow" and "woof woof"

3. Associate the object with the appropriate sound:

"beep beep beep" for car; "moo" for cow

D. Acoustic elements are stressed less, and faded to a more natural presentation. The child may then be required to discriminate on the basis of the specific acoustic elements of the sounds which form words.

IV. Comprehension

The child develops comprehension after exposure to consistent repetition of specific words. Choose one or two words differing acoustically and provide many opportunities to hear the word alone and in context.

Comprehension is demonstrated by the association between the word and the object or happening; the child recognizes the word "up" for example, to be a symbol for the action of moving something upwards.

A. The child learns to identify specific objects by listening to their names; begin with the presentation of words which differ acoustically, such as a one-and a two-syllable word.

1. Use action words indicating the way objects move: go, stop, jump, walk.

2. Teach adjectives that are easily identifiable: big, little.

3. Use combination of noun + verb, and adjective + noun: the child must comprehend both elements in order to respond correctly (e.g., "car go"; "airplane up"; "big ball").

B. Use of stress in comprehension is important. Stress plays an important role in the input of language. You expand on what the child says spontaneously, stressing the element which expands what the child produced.

At the levels of attention, discrimination and comprehension, the child's own vocal output is important. We are working on expressive attention and discrimination, as well as the receptive process.

References

Barrera, I. Knowing and teaching deaf-blind children. Deaf-Blind Project, Education Service Center, Region 20, 1975.

Franklin, B. Stimulating use of hearing in deaf-blind children. P. Hatlin (Ed.), In Proceedings of a special study institute. Berkeley, Ca.: 1970. Pp. 47-50.

Gardner, E. Fundamentals of neurology (5th ed.). Philadelphia: W.B. Saunders, 1975.

Groves, C. Speech and language assessment and development in the deaf-blind child. In Diagnosis and evaluation of deaf-blind children. Workshop Proceedings. Denver, Co.: Mountain Plains Regional Center for Services to Deaf-Blind Children, 1971.

Karp, E., Luterman, D. An auditory emphasis program for training children with impaired hearing. Boston: Emerson College (mimeographed), no date.

Kellen, J. A learning systems approach to intervention. In H. Myklebust (Ed.), Progress in learning disabilities. New York: Grune & Stratton, 1975.

Pollack, D. Acoupedics: A uni-sensory approach to auditory training. The Volta Review, 1964, 66, 400-408.

Robbins, N. Educational beginnings with deaf-blind children. Perkins Publication No. 21. Watertown, Mass.: Perkins School for the Blind, 1960.

Robbins, N. Auditory training in the Perkins deaf-blind department. Perkins Publication No. 23. Watertown, Mass.: Perkins School for the Blind, 1964.

Sanders, D. Aural rehabilitation. Englewood Cliffs, N.J.: Prentice-Hall, 1971.

Topp, S. Abnormal central auditory processing. In (B. Jaffe (Ed.), Hearing loss in children. Baltimore: University Park Press, 1977.

Whetnal, E., Fry, D. B. The deaf child. London: William Heinemann Medical Books Ltd., 1964.

Suggested Readings

Barr, D. Auditory perceptual disorders. Springfield, Ill.: Charles C. Thomas, 1972.

Griffiths, C. Auditory training in the first year of life. In Proceedings of the international conference on oral education of the deaf (Vol. I). Washington, D.C.: The Alexander Graham Bell Association, 1967.

Hirsch, I. Auditory training. In H. Davis and S. R. Silverman (Eds.), Hearing and deafness (3rd ed.). New York: Holt, Rinehart & Winston, 1970.

Lowell, E., & Stoner, M. Play it by ear. Los Angeles: John Tracy Clinic, 1960.

Miller, J. The use of hearing by the deaf-blind. In W. A. Blea (Ed.), Proceedings of the national symposium for deaf-blind, 1972. Southwestern Region Deaf-Blind Center, 1972.

Myklebust, H. The psychology of deafness. New York: Grune & Stratton, 1960.

Olson, L. Beyond bells and drums: New techniques in auditory training with deaf-blind children. In W. J. Smith (Ed.), New Techniques for working with deaf-blind children II. Workshop Proceedings. Denver, Co.: Mountain Plains Regional Center for Services to Deaf-Blind Children, 1973.

Pollack, D. Educational audiology for the limited hearing infant. Springfield, Ill.: Charles C. Thomas, 1970.

Regan, C. L. Handbook of auditory perceptual training. Springfield, Ill.: Charles C. Thomas, 1973.

Streng, A. et al. Hearing therapy for children. New York: Grune & Stratton, 1955.

Watson, T. J. The use of residual hearing in the education of deaf children. Washington, D.C.: The Volta Bureau, 1961.

Weiner, H. The auditory approach for training hearing impaired children. In W. J. Smith (Ed.), New techniques for working with deaf-blind children II. Workshop Proceedings. Denver, Co.: Mountain Plains Regional Center for Services to Deaf-Blind Children, 1973.

Whitfield, I. C. The auditory pathway. Baltimore: Williams & Wilkins, 1967.

Zigmond, N., & Cicci, R. Auditory learning. Sioux Falls, S.D.: Adapt Press, 1968.

Honey Weiner
407 Washington St.
Brookline, MA 02146

COMMUNICATION

BEGINNING COMMUNICATION: PRESYMBOLIC SKILLS WITH MULTIHANDICAPPED CHILDREN

Judy Young Burton

The initial relationship between teacher and child must be fashioned after the mother/child relationship. The teacher (caregiver) meets basic life needs, e.g., feeding, bathing, dressing, playing, moving through the environment, and companionship. Caring for an infant creates a feeling of satisfaction for both the caregiver and the child. A secure and consistent relationship promotes a language environment in which a dialogue, i.e., a conversation, can develop. This conversation, either verbal and/or tactile, can be referred to as a rhythm between two persons, as well as a discomfort/pleasure cycle. The mother interprets baby's movements and vocalizations as requests for a need to be satisfied. In fulfilling the child's perceived needs, the mother teaches the child that he or she is adequate to express his or her needs and that they are important.

A mother naturally supplies appropriate language in all her daily activities with the baby. The mother uses "parallel talk" (talking about events as they occur); she assumes both sides of the conversation; and she "talks" with tactile cues, body language, and rhythm. Mother corrects the baby's motor output to correlate with her language input. Recent studies have shown that babies use body movement which is synchronous with their mothers' voices.

Through these mother/child dialogues, the child learns that his or her needs can be communicated and can be satisfied. Infants communicate to another person in many verbal and nonverbal ways because they want or need something. In a classroom situation, the teacher/caregiver observes the child's behavior, interprets the physical experience of the child, and then responds to the need. For example, the teacher may observe a child pulling at his or her diaper; a decision is made that s/he is experiencing "wetness." The teacher responds by changing the diaper. Through repeated experience, the child learns that pulling his or her diaper will bring an adult to alleviate the discomfort. Thus, as a result of the teacher/child interaction, a signal is developed, reinforced, and modified for use as a natural gesture.

Babies learn to anticipate events. When the baby expresses a need, s/he learns to prepare mentally for the events that follow. Through his or her interactions with others and with the environment, s/he perceives more details and discovers more about already familiar situations. Slight changes in the routine will cause the baby to adjust his or her behavior to meet the new circumstance. This adjustment implies an adjustment in his or her thinking.

As one mother of a multihandicapped child stated, "What most children learn incidentally, I had to serve to my child on a 'sensory silver platter.'"

This "sensory silver platter" prelanguage foundation includes the following components:

1. Resonance: Physically touching the child's body, teacher and child move (e.g., rock, sway) together, "echoing" each other's movements. The child's body resonates from the teacher's body.

2. Co-Active Movement: The teacher and child move (e.g., crawl, walk, roll) together with increasingly greater distance between their bodies. The amount of distance is dependent upon the child's ability to watch and follow the teacher's movements. There must be a definite beginning and end to all movements. The movement becomes more complex as the child succeeds in simpler movements.

3. Object Anticipation Shelf: A defined area should be arranged in the child's environment where s/he can find an object that serves as a "symbol" for the activity that is about to take place. An example of this is when the child gets his or her bib before lunch or wears a smock during motor activities or takes a ball with him or her when going for gross motor activity.

4. Object Permanence: The child reaches a stage of awareness so that s/he is sure that an object still exists even though it cannot be seen or heard. S/he can comprehend a complex series of displacements and search for the object. The establishment of object permanence implies that the child may be able to develop signals and signs for communicative purposes.

5. Nonrepresentational Reference: This stage involves recognizing and indicating body parts in more detail and the use of pointing behaviors and increasing distance. Imagery is developing. It is a stage which prepares for more advanced imitations and prelanguage/language skills.

6. Imitation: The purpose of motor imitation stage is to create generalized imitative behaviors, to develop the refined body perceptions and motor planning necessary for finer imitations, and to increase the distance between the child and his or her world.

7. Gestural Communication: The natural gesture is a movement that represents how an object is used or how the child moves the object and is the beginning of true representational communication. The natural gesture can be a step toward formal language (sign or speech).

Eventually we observe how children motorically use objects or their bodies. We utilize these movements, reinforce them, and call them natural gestures. Natural gestures are a pantomime of how the child uses something. One child moves his or her index finger and thumb together as if flicking ashes. That is his or her natural gesture for cigarette. Next we formalize that gesture to a drawing, formalized sign, or speech, written word, etc. What we have been doing is teaching the child about distance. We started with his or her body, moved to objects, and now the child can communicate about things even when he or she is not physically present to see, taste, touch, or hear. The child thinks and communicates in symbols.

In summary, prelanguage skills toward symbolic communication are based on (1) interaction with the environment in an organized fashion, (2) intentionality, (3) an awareness of one's self as being separate from the environment, and (4) reasoning in ongoing situations.

Judy Young Burton
Callier Center for Communication Disorders
1966 Inwood Road
Dallas, Texas 75235

LANGUAGE ACTIVITIES FOR THE HIGHER-FUNCTIONING DEAF-BLIND CHILDREN

Faith Carlson

The information in this paper is based on the experience gained in the nonoral program at Meyer Children's Rehabilitation Institute. It is a constantly changing and developing program. Some of the ideas have been tested and proved successful with limited numbers of severely handicapped children. Other ideas presented are still in their embryonic stage. Everyone working with these children needs to be encouraged to be creative and resourceful in developing systems for each child's communication.

Many deaf-blind children and severely/profoundly handicapped children have similar communication needs. The standard symbol system (speech) is often not possible for these children as an initial system for communicating. Alternate symbol systems have provided them with a means to communicate. In a few cases the alternate systems have eventually led to speech. In order to defelop effective communication system for each child it is essential to evaluate thoroughly the child's skills, become aware of his/her environmental limitations, and educate parents, siblings, friends and everyone in contact with the child, in that child's manner of communication. In order to be most effective, communication work should begin early. Work needs to begin at birth or as soon as the child's problems become evident.

Evaluation

Formal speech and language tests often are not appropriate for the child with a severe communication problem. Although some tests can be adapted and used with the child, formal testing results often do not provide the types of information necessary for the development of a nonoral communication system. Systematic observations of the child, backed up by interviews with parents, teachers, or others familiar with him/her can provide the information needed to develop a communication system. Since these children often have a variety of overlapping problems, each system must be tailor-made for individual needs.

The Parent-Teacher Interview and Communication Evaluation Guidelines which follow outline some of the areas that need to be systematically observed. The same format can be used to interview and evaluate. The evaluator will need to construct situations in which the child can be observed to answer the guideline questions.

PARENT-TEACHER INTERVIEW AND COMMUNICATION
EVALUATION GUIDELINES

Question Areas	Example Observations or Answers
Child's communication: Expression	
Does the child let you know his/her wants, needs, feelings?	Yes, whines when hungry, rolls toward favorite toys, kicks when doesn't like something.
How does he/she "tell" you things?	Reaching toward, fussing, gazing at, increase in general activity.
Does the child have some way to indicate yes/no?	Frowns for "no, I don't want it," claps for "yes."
What type of verbal skills does the child exhibit?	Occasionally says a word, yells, soft phonation during play.
Child's communication: Understanding	
How does the child respond to sound?	No reaction to music, startles to loud sounds, turns to his name, points to named objects.
How does the child respond to visual stimuli?	No vision, gazes at light, seems to enjoy looking at pictures.
How does the child respond to tactile stimuli and movement?	Wants to be held, prefers fuzzy items, imitates hand swings.
Environmental interaction	
What are the child's favorite toys and activities?	Watching commercials, putting items in holes, running.
How does the child play?	Throws most items, uses real objects purposefully (combs hair, stirs with a spoon).
How does the child respond to people?	Smiles when mother enters room, kicks baby sister, phonates more when around other children.

Question Areas	Example Observations or Answers
Where does the child spend his time?	Wheelchair-bound, majority of time in living room or school, visits friends with family.
Skill limitations	
What visual, motor, auditory limitations does this child have?	Child sees light and shadow, blind, visual-motor problems: items need to be placed to the left, can maintain head control only in reclining position.
What medical problems now or in the past have limited opportunities for communication and learning?	Child frequently critically ill 3 of the first 5 years of life, seizures every few seconds, frequent ear infections reduce hearing.
List other pertinent information:	Child will be getting a new wheelchair for better head positioning soon. Signing used in the past and mother has negative feelings about it.

Because of their many and complex problems these children often communicate in very subtle ways. Observation skills will need to be refined and parents or others questioned in detail about specific child activities. If the parents state they just have a sixth sense about when the child is hungry, pursue that further; does he or she become more active, fuss, or what? If they can't remember, ask them to observe and report later. During the observation a child who fusses for his or her favorite toy may fuss in a different pitch for food or combine it with a slight increase in body movement. The answers parents and teachers give and the observations will then serve as a basis for a communication system. Outline all the child's skills rather than the deficits as determined by observation and report. In some cases the child's skills may only occasionally be used (e.g., child phonates in the warm swimming pool and when relaxed). These minimal skills can be built upon in the future so take careful note of them. For some children the initial movement of the head ½-inch to the left has progressed to a full

turn used for "no." In other children awareness of brightly colored pictures has developed into the use of pictures as symbols for communication. As the child progresses, constant re-evaluation will be necessary. The early minimal skills should improve and new avenues for communication should develop.

The skill areas will help to determine the possible modes a child can use for communication. Mode in this case refers to the method of indicating or differentiating the symbols of communication. For the average individual the human voice is the most common mode. Reaching, pointing, hitting a switch, or some other rehearsed body movement may be used as a mode for some children. Eye pointing or gazing at or toward items can be trained as a visual mode for communication. For some children with minimal skills, many modes may be combined. Mode 1 could be two varied hand movements used as a gesture, mode 2 could be gazing at four separate places, and mode 3 the use of a smile for yes. By combining the three modes the child would have a larger vocabulary than if s/he were restricted to a single mode.

Communication mediums which are compatible with the modes a child is able to use will need to be given a trial on the basis of the child's determined skill areas. The term medium here refers to the symbols or symbol system which the child will use. In the case of most individuals, speech is the medium used. The symbol can be an object, picture, printed word, gesture, or sign. Each symbol must have a meaning that is common to both the child using it and the person receiving the symbol. That symbol is the medium which comes to stand for the referent (an action, idea, object, person,) in the child's environment. A child who has touching as a mode could use a triangular rough shape as a symbol for "eat" and a smooth circle for "jump." If the listener cannot discriminate the feeling symbol, the shape can be labelled with a printed word or picture which is the listener's medium for communication.

Modern electronics, carpentry, the toy industry, and others have provided devices which can compensate for skill deficits. A toy cash register on which the numbers have been changed to pictures has served as an early communication device. Two-inch pieces of plexiglass tubing mounted on a flat plexiglass piece make wells which will catch the hand of a child unable to point. Automatically sequencing lights on an electronic board can indicate a choice for the child who can hit a single large switch. Items like these will permit a child to use a mode that may not otherwise be available. The child who can point, but cannot speak, can do so with an electronic voice which produces spoken symbols (electronic speech).

The skill areas which will determine possible modes, mediums, and equipment needs can be applied to a chart like the following one to help the evaluator organize and plan for each child.

Child's Skill Areas	Possible Modes	Possible Mediums	Special Equipment Needs
Visual	Eye pointing, looking	Printed symbols, pictures, objects, printed word, light patterns	Lighting device, plexiglass board for looking response
Tactile	Touching with hands, mouth, arm	Braille, varied textures, textured shapes	Braille printer, standard structures for displaying shapes or textures
Auditory-Oral	Human voice, noisemakers, electronic speech, electronic sound impulses	Morse code, speech, predetermined sound codes	Handi-Voice, impulse production device, bells and other noisemakers, hearing aid
Movement (specific or genral body)	Pointing, head motion, use of head stick, crawling or walking toward, hand movements, typing, drawing	(All of the above mediums), gestures, signs, pantomime	(See above) Special switches and electronic devices, boards with wells or ridges for children with limited movement, typewriter, head sticks

Since most classrooms do not have the equipment and material that may be needed by a nonoral child, the early development of a communication system would ideally take place in a setting which does. That is not always possible, but those settings should be taken advantage of whenever available. The type of adaptive equipment a child can use and the workable symbols often can only be determined after trial sessions.

Developing A Communication System

Many children who have had months and years of experience of living without communication have no motivation to try communicating. They do not realize that they have the power to change their environment by using symbols to express their choices. It may become necessary to construct situations which accidentally cause them to use the modes and mediums of communication so that they can discover its power and joy. The child who only has generalized communication like fussing might be thirsty and want orange juice. The mother who only knows something is bothering him/her might give the child some oatmeal to eat. The child stops fussing because from experience s/he has learned specific wishes like the orange juice cannot be satisfied. The opportunities for communication will need to occur in every setting, at home, school, at the store, and in the car. This involves training and working with the family, school, and friends before and while the child learns to use her/his communication system.

It will also be important to select symbols which represent things of interest to the child. The child who likes to be rocked, helped to jump, and roll should start on action symbols representing these enjoyable activites. If eating is a difficult task, food-related symbols would be a poor choice for the child. An excellent guideline is to pretend s/he was a talking child and imagine what the child would be saying in each situation. Early communication will not be fostered if only needs and emergency symbols are selected. Things like "bathroom," and "hurt" are things parents and teachers want and need to have the child communicate. The following Vocabulary Selection Guidelines can be helpful:

Expressive Communication

1. Observe the objects, activities, and people of interest to the child. Have the parents list those they note are of interest at home.

2. If the child can assist in the selection, let him/her make some of the decisions.

3. Initially select vocabulary that can be used frequently.

4. Do not select things you want the child to communicate which may not be of interest to him/her.

5. Items which meet the guidelines of #1, #2, and #3 can be selected even if the child does not understand the label yet.

Item Arrangement for Expressive Communication

1. Introduce items for communication purposes slowly.

2. Arrange items in category groupings so they can easily be located.

3. As more concepts are introduced, arrange in a left to right progression that easily forms sentences.

4. As larger numbers of items are used, color-code them for ease of location of category groupings.

5. Alter arrangements only when absolutely necessary; a permanent arrangement makes items easier to find.

6. Make any communication arrangement attractive, easy to discriminate, and accessible to the child. Take any visual acuity problems into consideration when selecting item size.

7. Space items so the child can easily point to them.

Once a mode and medium for communicating have been selected, vocabulary outlined and equipment made available, the system can be put into practice. For the child's initial encounter with symbol communication, select several pairs (jump/run, candy/truck) of symbols from the potential vocabulary and their referents. Present one set to the child and indicate its referent. The parent or teacher may show the child the jump symbol and then help the child to jump, make a doll jump, and do the same for run. Both symbols then can be made available to the child, and using his or her mode of indicating (pointing, touching) give the child or help the child carry out the referent (help him or her jump if s/he points to jump). It will be important for the child to observe the parents and teachers use that form of communication.

They will need to use the child's mode and medium to communicate with siblings and other students, as well as to communicate with the child and to make comments on their own activities. If no one else uses the child's communication, s/he has no model for communicating. If the child is in the kitchen with mother as she is cooking, Mom could point to the symbol for food as she gets out the spaghetti, the water symbol as she washes a dish, and point out the chair symbol if she wants the child to sit down to eat. As soon as possible, sets of three, four, and more symbols should be employed.

As soon as a symbol system is introduced in one setting, it should be employed in all settings throughout the child's day. If at any point the symbols are not available, substitute real items so that the child can always communicate in some manner. The pattern of not making choices must be broken.

Initially the child will not understand the symbols, but s/he can learn through accidental use of the symbols. This parallels the manner in which normal children learn words. They not only hear them said by others, but accidentally say sounds that parents assume are words. These sounds are reinforced by receiving the word's referents. The child says "ba," and the parent says "ball" and gives him/her a ball. The nonoral child gazes at or accidentally feels the symbol for ball, and the parent gives him or her the ball and plays a ball game for awhile. Frequently the parent can direct the child's attention to the symbol and back to the ball in much the same way parents of normal children talk about the ball as they play with their child.

Once the child has begun to spontaneously communicate on a single-word basis, symbols should be presented in a pattern to foster sentence use. This can be done with as few as three available symbols. Symbols for "Mom," "Dad," and "eat" can combine to mean "Mom eats," "Dad eats," "Mom, help me eat," etc. A left-to-right arrangement is best, because, hopefully, the child will move on to printed words or their equivalents and left-to-right is the arrangement of printed words.

Longer and longer sentence patterns can be encouraged as the child progresses. As new concepts are acquired more advanced grammatic structures can be employed by the child. Symbol arrangements can make question patterns and prepositional phrases available to the child. The Fitzgerald Key provides an excellent source of reference for the symbol arrangements.

As the vocabulary becomes larger, remembering where symbols are located becomes a problem. Coding systems can be helpful. The child with visual skills could make use of color codes (nouns red, actions green). The child who uses touch could use a code of shape types (long shapes are nouns, rounded shapes verbs).

Whenever possible, alternate symbol systems need to be considered a temporary means for communicating. Nonoral systems often can be stepping stones that lead to speech. Pictures, shapes, and Blissymbols can lead to the use of the printed word or Braille, which are more widely-used systems. By encouraging general phonation, specific phonation patterns, and later word approximations in conjunction with the alternate medium, many children have learned to speak. Pairing more primitive symbols with the printed word and Braille and gradually fading the early symbol often leads children into reading.

The mode or medium chosen makes no difference unless it is not successful; then further evaluation and ingenuity on everyone's part becomes necessary. Every child deserves the right to the joy of communicating.

Glossary

Listener does not just refer to a person hearing speech, but to anyone receiving any type of symbol. The listener may listen by looking at a picture the child reaches toward.

Medium is the series of symbols a child uses. For some the medium might be pictures and her/his mode of pointing, looking toward, or hitting a switch to light the bulb by the picture. For others the medium might be a pantomime of drinking water and the mode the movement needed to execute the pantomime.

Mode is how a child indicates a specific symbol. A child might use sound, touching, pointing, body movements, looking, or other activities as her/his mode of communication.

Referent is the object, action, or person that is being symbolized. If the symbol is a picture of a boy jumping, the referent would be the action of jumping. If the symbol is a triangular shape which has been paired with a cup of water, the referent is the water which the child can drink.

Symbol refers to any picture, object, sign, sound, gesture, or word which has a common meaning for both the child and "listener" (parent, teacher, peer). Example: For one child the sound "ah" might be the symbol for "I want pop." Two red dots of light for another child might symbolize a toy truck.

Faith Carlson
Speech Pathologist
Meyer Children's Rehabilitation Institute
University of Nebraska Medical Center
444 South 44th Street
Omaha, Nebraska 68131

COMMUNICATION TRAINING FOR THE DEAF-BLIND

Judy A. Cooper

Communication training for the deaf-blind is such a vast and intricate topic that to discuss it thouroughly would entail writing a book. This paper will highlight some of the primary concerns the teacher of the deaf-blind usually has in setting communication goals for the students.

Communication is the basis for understanding new concepts and thus for growing and learning. As normal children develop they go through specific stages in both expressive and receptive language development. For the child with sensory handicaps the environmental stimulation is diminished and the child, in turn, loses opportunities to develop language normally. When the child has a mental impairment in addition to the sensory handicap, the chance to develop normal language is diminished even more.

Language training, then, can become a particularly frustrating and unrewarding experience for the teacher. Many times teachers are given a curriculum guide to follow that begins its lessons completely out of the range of the student's functioning. Teachers feel they must adhere to the curriculum guide and structure of their lessons around it. They become upset because the child is not learning and undoubtedly the child becomes frustrated at constantly being pushed to perform at a level he isn't ready for.

But there is hope. The main thing to remember is that all children communicate. They may not have formal language systems, but all of them indicate their feelings in some manner. By understanding normal child development, the teacher of the deaf-blind can diagnose the child's language level and begin training with appropriate activities. In addition, it is imperative that the teacher understand the type of sensory deficits the child has, how to use and care for adaptive appliances, and how to work with other professionals in using their resources to plan more effectively.

Because there are a wide variety of topics in the presentation, this paper will summarize the areas of language development, sensory deficits and how they affect language development, choosing a method to teach receptive and expressive language, and hearing aids.

Language Development

One theory of development that many educators of the deaf-blind have used is Piaget's theory of child development. Since most of the deaf-blind are low functioning, an understanding of the six sensory-motor stages which take the normal child through 18 months is the most beneficial.

Piaget felt that all children go through these stages as they develop and that one stage had to be attained before the next one could emerge. He did point out that there were no clear-cut divisions between the stages and that earlier stages became incorporated into other following stages. Piaget also felt that motivation for learning came as the child was exposed to success and new experiences. He contended that children did not learn an activity to satisfy one need but several. It was the satisfying of these needs, then, that made the child really understand an activity or concept and apply the new knowledge in future situations.

Basically the six stages in the sensory-motor period are:

Stage I (0-1 month). During this period the child begins to move from simple reflexive movement to the adaptive use of movement. Primarily, the reflexes of crying, sucking, gross movements, and senses are exercised.

Stage II (1-4 months). Children combine reflexes into unitary action patterns, e.g., sucking and grasping, seeing and grasping. For the first time they can modify movements a little. As a result of it, future movements emerge into more awareness and exploration. The child may repeat a response merely for the pleasure of it.

Stage III (4-8 months). At this point children begin to constantly repeat chance movements, and actions become more intentional. They begin reaching for a desired object and have a simple gesture response to familiar objects. They also use these movements in an attempt to make an interesting sight or sound last. They become more interested in seeing how their movements act on the environment.

Stage IV (8-12 months). Children's behaviors are now unquestioningly intentional. Their reactions to new situations change. For example, they do not just look at something, they explore and manipulate it. They can now begin to anticipate happenings from the environment.

Stage V (12-18 months). Children now use different actions to investigate their effects. They are able to separate the act from the object. They begin to vary acts to see the effect on the object they are playing with. They begin to understand that every action has a consequence.

Stage VI (18 months +). At this time children discover how to do new things through mental combinations and active exploration. Their inner language is developed and they use this synthesized information to find out how to do something.

These six stages of sensory-motor development correspond to the five stages of language processes that Robbins and Stenquist discuss: sensation, perception, imagery, symbolic, and conceptualization (see charts).

It is important to remember that deaf-blind children may not follow the sensory-motor stages concurrently with the language level stages, especially where there has been reduced language experiences in the environment. More emphasis may have to be placed on enrichment experiences to prepare the child for language training at a higher level. Activities for enrichment will be discussed later.

Sensory Deficits

Piaget's sensory-motor period emphasizes the need for environmental stimulation to provide experiences for normal development. When children have reduced visual and auditory input they will automatically have limited experiences. It is important that the teacher understand what the sensory deprivations are and what implications they have in communication programming.

Let's consider visual impairments first. Reduced visual input means less stimulation from the environment, as well as less receptive language comprehension if manual communication or lip reading is used. Before planning the program the teacher should answer the following questions about vision:

1. What is the cause of the child's visual impairment?
2. What is the vision both corrected and uncorrected?
3. Would medical intervention help improve vision?
4. Will the vision deteriorate?
5. What sensory mode does the child use most in exploring the environment?

Once these questions have been answered the teacher should then consider the auditory impairment. Again, understanding the loss before planning will make the goals more meaningful.

1. What type of hearing loss does the child have?
2. Is medical intervention indicated?
3. How severe is the loss and what frequencies are most affected?
4. How much does the hearing aid help?
5. To what degree is the child presently auditorially aware?
6. Does the child like sound toys and does he use his voice?

Because the deaf-blind population is not a homogeneous group, other sensory deficits may be present. Read medical records thoroughly to note special neurologic or physical problems that may impair the other senses, especially the tactile and kinesthetic modes.

Once sensory deficits are correctly diagnosed, the teacher can choose the best sensory modality through which to teach language, be it hearing, vision, or tactile. Once the modality is chosen, daily plans can be structured in a consistent manner. It is also important that the teacher be involved with the audiologist, ophthalmologist, pediatrician, and other professionals in periodic reassessments to help pinpoint changes before major problems occur.

Choosing a Teaching Method

There are a multitude of ways to go about teaching language to a deaf-blind child and none of them is better than the others. The main thing is to be consistent in using the chosen method. For example, if total communication is a comfortable method and the child seems to respond well, then it should be used. Sometimes schools or centers decide to use one particular method rather than have teachers choose their own. This increases consistency and the students (especially the low functioning ones) are less confused by changes between teachers. If the teachers are using signs, a signing system should be chosen and used throughout the school. If natural gestures are used it might be helpful to plan to use the same ones in all the classes to create a modified signing system.

Some of the popular methods used to teach language in deaf-blind programs are:

Total Communication. A combination approach including speech and auditory training and signing. Programs are modified to fit individual needs.

Signing Exact English. A signing system based on a linguistic approach. Sentence structure is the same as spoken or written English.

American Sign Language. A signing system utilizing a conceptual approach. This type of signing consists of word and phrase combinations and emphasizes ideas. Most nonverbal deaf people use this signing system among themselves.

Language Through Movement. A systematic program based on Van Dijk's theories that children learn to imitate best through movement. Six stages take the child from gross cooperative movement to formal language systems. Other communication methods are often incorporated with this approach.

Some general tips in teaching communication skills to the deaf-blind child are:

1. Try to move the child from inward direction which includes flicking, head rolling, and other self-stimulatory behaviors to outward directions in which the child responds to environmental stimuli through visual tracking, sound localization, and exploration.

2. Don't bombard children with too much sensory stimulation at one time or they may withdraw more.

3. Examine children's adaptive or cognitive level before planning language goals. If they are at the mouthing and banging objects stage then they aren't going to be ready for a formal sign system.

4. Respond to the child's signal behavior and natural gestures. Try to shape these behaviors into consistent communication. Pairing signs with natural gestures is often helpful.

5. Provide a lot of environmental awareness activities. Explore the room halls, and immediate environment with the child.

6. Try to make communication learning tasks as natural and meaningful as possible. Avoid abstract tasks such as imitating signs in a nonrelated situation.

7. Provide toys with cause and effect relationships to help build interlanguage and problem solving.

8. Always respond to the child who asks for help.

Remember that a good language program is based on organization and purposeful activity. Plan language activities around the current level of functioning. Don't set arbitrary limits, but do realize that the child may have stopping points. Above all, remember that every step is a step in the right direction.

Hearing Aid Wear and Care

Many deaf-blind children have hearing aids and even though they do not develop speech even with intensive programming, the aid can be helpful in increasing environmental awareness. To get maximum benefit from the hearing aid it should be worn consistently, and an auditory training program should be ongoing. The audiologist and otologist should be consulted regularly for checkups and reassessments. The audiologist not only tests hearing but evaluates the aid's performance and notes repairs needed. The deaf-blind child should be seen at least annually by the audiologist. The otologist should also be seen yearly. Many deaf-blind children have a tendency for middle ear infection, which can create a conductive loss in addition to a sensory neural loss. Medical monitoring can minimize these problems by treating infections right away and providing other medical intervention when indicated.

The classroom teacher can help keep the aid in good working condition through a daily monitoring program. The audiologist can help teacners develop a checklist that will meet their specific needs. Some general suggestions for daily hearing aid maintenance that will maximize performance are:

1. Wash earmolds in warm soapy water, rinse well.
2. Check cords and connections. Listen for distortion.
3. Check the battery or recharge the aid if there is no battery. Check battery compartment for corrosion.
4. Use a soft brush to clean outside of aid.
5. Check controls for proper settings and freedom of movement.
6. Check receiver for signs of cracks, dirt, or moisture.
7. Contact the audiologist or hearing aid dealer right away if you suspect repairs are needed.

In summary, teaching language to the deaf-blind child need not be a totally frustrating experience. Remember to set realistic goals and keep in mind that each child has a primary sensory mode for learning and that s/he will have limits on how much s/he can do at one time. Take the time to assess the child's language and adaptive levels before planning long-term goals and activities. Keep in mind, too, that children communicate in some manner and if that method is meeting their needs, capitalize on it.

Developmental Levels and Activities

Language Level	Sensory Motor Stage	Nonverbal Communication Used	Activities to Stimulate Language with the Deaf-Blind
SENSATION	Stage I	Cries when dissatisfied. Smiles when satisfied. Doesn't try to bring about change.	Provide lots of touching activities to increase environmental awareness, e.g., rub child with different textured materials, tickle with feather, expose to warm and cool items. Hang brightly colored objects and sound toys above on a mobile. Encourage children to lie on their stomachs and explore objects and the floor beneath. Move them around in different positions. Encourage sounds. If an aid is prescribed, make sure the child wears it. Guide the child's hands over objects to familiarize the object.
PERCEPTION	End of Stage I Stage II	Children begin to anticipate, e.g., smile and reach out when they see food. Try to get adult to help them in a general way, e.g., grabs adult's hand. May use some basic informal gestures to get attention.	Encourage children to indicate they want attention. Play little motor games that will increase attention span and imitation skills, e.g., pat-a-cake. Use a few basic signs after attaining children's attention. For example, when you bring their food, make the sign for "eat" and then guide their hands to their mouths. Don't expect any formal expressive signing from them.

Language Level	Sensory Motor Stage	Nonverbal Communication Used	Activities to Stimulate Language with the Deaf-Blind
IMAGERY	Stage III Beginning Stage IV	Moves about objects to make situations happen. May use some signs to indicate immediate needs. Labels objects (learns names of objects), then signals wants.	Begin gross motor imitation activities. Move to formal signing for objects and wants. Provide experiences that will enrich child's receptive and expressive signing vocabulary. Always talk as you sign. Have child complete matching activities in other areas, e.g., matching objects, pictures, etc.
SYMBOLIC -118-	End of Stage IV Stage V Beginning of Stage VI	Can sign for all needs. Can sign in simple phrases about wants or accomplishments. Can pantomime situations they remember. Language still centered around personal experiences.	Move to noun/verb phrases in signing. Provide enrichment experiences that will promote expressive signing. Start teaching adverbs, adjectives, and prepositions. Begin teaching concepts of time.
CONCEPTUALIZATION	End of Stage VI Child moves out of sensory motor stage	Child can sign or pantomime about situations not personally, motorically expressed. May make up stories. Able to understand abstract concepts.	Child should gradually move into signing with full sentences. Expressive language should be stressed. Child should learn to express all immediate needs as well as future needs. Language at this level will progress in accordance with the child's abilities. Encourage language not only at language sessions but in all facets of the school day even more than ever.

References

Books

Guldager, V. Body image and the severely handicapped rubella child. Watertown, Mass.: Perkins School for the Blind, 1970.

Robbins, N., & Stenquist, G. The deaf-blind rubella child. Watertown, Mass.: Perkins School for the Blind, 1970.

Articles

Chappell, G., & Johnson, G. Evaluation of cognitive behavior in the young nonverbal child. Language, Speech, and Hearing Services in the Schools, 1976, 7, 17-27.

Van Dijk, J. The first steps of the deaf-blind child toward language. The Education of the Blind, May 1966.

Papers

Burroughs, J. Theoretical models for assessment of cognitive development in deaf-blind children. Dallas: Callier Hearing and Speech Center.

Cooper, J. Language training for the low-functioning deaf-blind child. Paper presented at Illinois Workshop for Teachers of the Deaf-Blind, March 1976.

Fieber, N. Movement in communication and language development of deaf-blind children. Omaha, Nebraska: Louis Meyers Children's Rehabilitation Institute.

Lachter, A. The Suffolk County A.R.C. deaf-blind program. Mid-Atlantic-North and Carribean Regional Center for Services to Deaf-Blind Children.

Robinson, P., & Allen, P. An educational approach utilizing developmental sequencing and co-active movement theory. South Bend, Indiana: Department of Public Instruction, Northern Regional Service Center, 1975.

Van Dijk, J. Movement and communication with rubella children. St. Michielsgestell, Holland: Deaf-Blind Unit, 1968.

Judy A. Cooper, M.Ed.
Institute for the Study of Mental
Retardation and Related Difficulties
130 South First
Ann Arbor, Michigan 48108

COGNITION

THE DEVELOPMENT OF THINKING

Dr. Hans Furth

Knowledge is related to what is intelligent--generally the kinds of questions that philosophers have asked in the past. You may well ask why you should be interested in a philosophical quest. Well, Piaget's perspective on knowledge is very different from many current ideas about knowledge, which may be why Piaget's theory is difficult to understand. It isn't difficult in itself, but it's difficult because it differs from many other things you believe. The only way for you to understand Piaget's theory is to examine your own knowledge of learning, memory, perception, action, and behavior, and relate these theories to your own life. It took me many years to understand Piaget's theory, and one reason why I found Piaget's theory interesting is because I work with deaf children. When I began working with deaf children there was only one theory about knowledge, and this theory said, "Unless you have language, you can't be a fully intellectual, healthy person." The theory said that through language we develop the kind of intelligence that makes the character of adult human beings. So I observed a few deaf people who were very poor in language, and I fully expected them to be deficient in intellectual performance. That was 15 or 20 years ago. Then what did I find? That many deaf children perform very similarly to hearing adolescents. They were able to organize the world logically. They understood logical conclusions; they understood visual perspective; they understood probability, combinations. Now if that's not logical thinking, what is? But they were very poor in language. And yet they know language. I know Latin but I don't make use of it in my thinking. If you see that, you begin to say that there is something wrong with this theory that bases intelligence on language. So I looked around for a theory, and that's how I found Piaget. This is why Piaget means something to me. You'll never bother with Piaget's theory unless it begins to mean something to you.

As far as teaching is concerned, Piaget's theory doesn't tell you how to teach. There is only one way Piaget can help you as a teacher: if you, as a teacher, want to encourage children to use their intelligence, Piaget can help you find appropriate activities that challenge the child's intelligence. To challenge a child's intelligence, the child must be intellectually active. I use terms like high-level thinking. You have to have high-level thinking because some thinking goes on even in the most routine activities. That's why I talk about high-level thinking, challenging thinking, or I use the term "developmental experience." We teachers want to provide developmental

experiences for children because developmental experiences challenge their intelligence, which causes the intelligence to develop. So where ever you meet Piaget, when you think of education, think that you're trying to present the theory because you want to provide children with opportunities to develop and nourish this type of intelligence.

Now I want to say a few things about what knowledge is, how knowledge functions. The word knowledge is something you have. Your knowledge is like a shirt--you should be glad it was given to you. Knowledge is a principle action. Knowledge is a know-how. You know what to do. Knowledge to walk means you know how to walk. Knowledge of numbers means that you can solve mathematical problems. So get used to the notion that knowledge is an activity. It always means that you know how to use it to think in terms of a know-how, and I use the word knowledge in thinking in more or less the same way.

Now, knowledge is an activity. Knowledge is always related to a person. Never say that there is knowledge in a book. There is no knowledge in a book. Where is the knowledge in relation to a book? The knowledge is in the person who wrote the book--is in the person who reads the book, understands it. The book is simply an intermediary (a product). Knowledge is always subjective because there's always a subject who has knowledge. Many people think that the less there is of a subject, the better for knowledge. People think that knowledge is a copy of something outside, and if they get away from the subject, then their knowledge gets better. That's just the opposite of Piaget, who believes that all knowledge is primarily subjective. You could say that knowledge is the relationship between the subject and the object. Consider an object as anything that can become an object of knowledge. For example, if you describe this window as a rectangle, then that's objective power. So, that's an object. This object only exists because we turn that into an object, because we know there's a subject who relates to this as an object and that's what knowledge is. Knowledge is a product of the object. Now, if you have your child ponder this window, this child sees no rectangular window because in order to see a rectangular window s/he has to know what rectangular means, what window means, and what see means. So what we call objective knowledge is a function of our mind, of our intelligence. Because we have similar forms of intelligence, we can all communicate.

Knowledge is a relationship between the subject and object and it's a relationship that constructs the object and in the same sense it constructs the subject, too. So, think of knowledge as a two-way street between the subject and the object.

Now, subject and object sound so philosophical, so let's simply say it's the relationship between persons and their environment. That sounds more biological. We also are biological beings and we have to relate to our bounds. Our environment is primarily what makes us produce. It isn't nature given or God given, it's man given. The names of objects and our languages are our own symbols. Thus, we create our own environment, and that's all created by knowledge. So knowledge is the relationship between the self and the environment. Sociologically speaking, society is created by us. So we have the capacity to create our lives, and that's what knowledge is doing. Environment is for other persons, for human beings. The relationship to other persons and the development of intelligence includes our getting along with other persons.

When you have any act of knowledge, you can distinguish between what is direct experience that can be observed and what is inferred. You could see a formation of certain materials and you could infer where it was made, why it was there, etc. So the relationship of subjects and objects is one relationship within knowledge. The other relationship is between what is observed and what is inferred. Piaget uses the word coordination for infer. You see, as I talk to you, you relate it to other things in the back of your mind. This relation is a kind of a coordination. You coordinate what you observe and experience with your past experience so that there's always a relation between what you observe and what you coordinate.

Piaget uses the term equilibration, and this is perhaps the most important concept of his theory. I'll tell you why. Equilibration is just another word for balance. A relationship has to be balanced in order to function. In order for you to see me, you have to relate your visual apparatus to me as an object, and unless this relation is in balance you wouldn't see me. So, you can always say that knowledge is always a balance between the subject and the object; the balance between what you observe and the theories to which you relate them is interpretation. It was an act of balance.

Take a three-year-old child who sits on a tricycle. What is the first thing this child is aware of? Having his or her feet off the ground. So you could say that the purpose of being on a tricycle is to move around. The object of the behavior is to move. So the child is aware of this.

The next thing the child becomes aware of is his or her own activity. The child's own activity is the subject. What is the most peculiar thing the child becomes aware of in this activity? His or her legs going around, and the tricycle moving without having his or her feet on the ground. The child does

this in order to reach an object. Now, knowledge in itself is always an intention to reach a certain goal. So the first thing one becomes aware of is the goal that s/he wants to attain. Then, you do an activity that leads to the goal.

The third step is that the child becomes aware of the framework within which the activity takes place. In other words, the child pushes on the tricycle and will distinguish walking on the ground from this activity. The child will relate it to things that are inferred. The child will coordinate this to other activities or other knowledges, other capacities that are related to this. The child will differentiate this activity from related activity. Just like if you listen to something, you will relate it to something that is familiar to you and you will say that is how it is different from here, that is how it is different from there. So, that's the third step in knowledge --it goes from here to there.

Does the child understand how the tricycle works? Not yet. How does a child eventually come to understand how the tricycle works? By experiencing movement. In order to understand how the object works, you have to understand how something involves movement in general. This really relates to the child's intelligence. We coordinate the activity to other activities we may be doing. Here you have created the child's intelligence. The child's intelligence is then applied to the object, and coordination means that he or she understands how the object functions. So the child eventually, by observing the activity, by seeing what happens, can apply his or her intelligence to this bicycle. The child begins to understand how a bicycle works. This is the fourth step in knowledge.

Once you understand how a thing works, your experience with it differs. For example, if you looked at this chair and were not an expert in chair-making, then you just perceive a chair. However, if you understand how to make a chair, if you understand about different materials, different shapes, then you would experience the chair differently. What I've tried to point out is a general scheme of how knowledge works. Knowledge is like a circle that never ends, because once you know more about the object, then you experience the object differently, and you experience your own activity differently. You experience your intelligence differently. Knowledge is a spiral that goes on and on and has no beginning and no end. This is a very different view from thinking of knowledge as being an entry in a dictionary. This is what explains the cause of intelligence. This is what equilibration means. Knowledge is a balance, but it is not a hindered balance. It is not like, for instance, like a balance in our bodies--that is homeostasis--and if you are ill, the temperature goes up, but the idea is going to stay down. The

idea is trying to save a balance. Knowledge is the idea that when this circle continues, it doesn't go back into the same circle. This explains the development of intelligence, because that is why Piaget uses the word equilibration and not equilibrium. You see, it is not a balance, it is equilibration--the force that keeps the knowledge balanced, but the balance is such that knowledge never returns to itself. Knowledge is always self-expandable, so don't think of it in terms of absolute beginning or absolute end. That is very different from teaching children that there's one answer to one question.

I want to tell you why this knowledge is so open-ended. Remember, the first knowledge contact has to do with the result of an action. The result of an action is something positive. It is as if you go to a store and buy something--it's the sweet. That's the positive thing. If I ask you what is this, and you tell me that is a rectangular window, that is the positive thing. That is what we call a fact. That is information. But that is only one side of knowledge. In order to understand a fact properly, you have to place it within a framework, and you have to compare it with other things. Knowledge is not merely focusing on what a thing is. Most of knowledge has to do with what it is not. The reason why you understand what a rectangular window is, is that you know how a rectangle is different from a circle, a triangle, or a square. You know a window is different from a table and chair and other things. You know that seeing is different from hearing. You know all these things as part of your knowledge. Knowledge primarily is concerned with these things, these coordinations.

As teachers, if we stress too much what a thing is, we give the children a wrong idea about knowledge. Knowledge isn't just one answer. As children, we learn that what is in the book is truth and knowledge. So, think of knowledge as taking a perspective. As soon as you infer, it is arbitrary what you infer. One reason knowleged is open-ended is because we infer things.

Equilibration is a cause of the child's development. In a sense there could be a contradiction. If equilibration means something is balanced, why should this ever change? Like our body temperature, why does it change? That is why you have to differentiate this balance from the body's balance. It is a balance, but it is a balance that creates its own disturbance precisely because it relates to these things. As soon as you coordinate it with other things, as soon as you infer things, then you relate it to things that are contraindicated, and you find it doesn't fit in. For instance, a child may think that bicycling is just like walking. But then the child realizes that it doesn't always work. It's not just walking in air. There must be something that is in between, so there's a contradiction. So, the child experiences some kind of contradiction,

and the experience of contradiction is an intrinsic part of knowledge. Knowledge creates its own contradiction. That is the only reason why we develop. Now, these contradictions--where do they come from? Who creates these contradictions? Are they created by the parents? By the teachers? No, they are created by the child. You see, we can provide occasions and hope that they will be challenging to the child. But we can't hold them from contradiction. You know we have tremendous capacity for not paying attention to any contradiction. We have to, otherwise we couldn't live peacefully. You know there are lots of things you hear, but you just put them out of your mind. Children do it all the time. We can't face up to every possibility, otherwise we wouldn't have a spare moment to relax. So I don't think we should be constantly high-level thinkers. We can't do it. All I'm saying is that a few times during the school day, children should be challenged, and in general children should experience school as a place where they are invited to experience developmental contradiction and where they are rewarded for engaging in high-level thinking. So, these contradictions are part of knowledge, and if you listen to Piaget's theory and don't experience contradictions of things that you have heard, then you are not aware of understanding your own thinking or Piaget's theory. So these are healthy contradictions!

I want you to think about examples how this scheme fits into everyday life. Children first think egocentric. That is the first positive experience a child has. So in order to overcome an egocentric perspective, you have to coordinate things, you have to put things into a framework, and then you can understand the things and their weight, although you may not experience them.

Think about a child going into a store and buying a sweet. What does a child experience? Satisfaction of getting a sweet. So that would be the object. That's the first thing the child experiences, and anticipation is part of it. Probably that's the reason the child wants to go in the store in the first place. Where does the child's intelligence come in? What does the child experience as far as the action is concerned that leads to the sweet? He or she has to decide which one s/he wants. Somebody has to pay, either the child or the parents. There's a particular action that gets the object. So, this is where intelligence begins to work. The child relates a particular action to a particular result, and by getting the result, that's part of intelligence.

How else will the child use his or her intelligence in connection with this particular activity? The child coordinates. I get sweets at home from just taking them or asking mommy. Here in this store, I can't just take them, I have to do a

particular action. That's coordination. That's the child's intelligence at work. That's high-level thinking. It doesn't mean mother has to tell the child, "now when you go to a store, you have to do this, but at home you don't have to do this." You don't have to tell children this. All healthy children eventually will think, when in this store I do a particular act. If I'm in school and I see a sweet, I say, "Please give me a sweet," and if he is a friend of mine, he will give me one. So the child begins to coordinate his or her action without actions, and what does coordination of objects mean in this example? What is the object here? It's the sweet, but I mean a little more than the sweet. The object is how the store works. How did the store get the sweet in the first place? Why does the store give me a sweet for money? Why do I pay money? So, coordination means understanding how the store works. This means a particular exchange that takes place. This means the particular activity that I'm doing. This means how this activity compares with other related activities, and how it fits into the scheme of things. Then, once the child's intelligence understands something about how money works, it is related to the store, and the child has a sense of how the store works. Now the child looks upon this exchange in a different light. This is intelligence in action. Now that is the idea that we would like to have at school. But if you tell your five-year-old children about how a store works, the children will be bored to death. And these will not be developmental experiences for the children because children want to discover them on their own. You don't know when a child is ready to think about it. One child may go to the store 10 times and never think about it. Another child maybe relates it to something else. We don't know why. In come occasions we are challenged, but it's not so different for us. Sometimes we read some newspaper just like it just goes by, other times we are interested and try to understand more. We should treat the children the same way we treat ourselves. That is how intelligence works. It doesn't mean that we apply all our intelligence during every activity, but the wonderful thing about intelligence is that any little bit can become an occasion for intellectual input.

This scheme does not just relate to verbal knowledge. It is like this example I give you now. Is it necessary for the child to put his or her experience with the store into language? Not at all. A child can understand how a store works, how money works, without being able to put it into language. That's the essence of knowledge. It means that you know what to do. The important thing, for instance, to understand how a store works is to understand why I pay money and the storekeeper has to pay money for this. In order to understand this you don't have to say it in so many words. Knowledge is not tied to words. The primary function of language in intellectual development has to do with communication. So, as the child communicates with another

child, the child has an opportunity to compare his or her perspective with another person's. So, it's communication that provides occasion for exchanging viewpoints. In this sense communication is a condition of development. If you have children under your care who don't easily share and communicate, that could explain why there's not development intellectually. The primary difficulty of some of your children may have nothing to do with general intellectual capability. If your children don't enjoy sharing things, if your children don't communicate with others, then you don't have the normal conditions of development. I've used the word coordination. Sometimes we coordinate things among us within ourselves. We compare them. But the more normal thing is to compare with someone else. This is how children coordinate. Now as we go out, we can do it on ourselves. If you think about a problem, and if you really work on it, vigorously, you will compare this to what you have heard somewhere else, and you will want another viewpoint, and that's when you are intellectually active. For little children, this activity often takes place by talking to another child. And that's where language comes in. It isn't that language provides the knowledge, but language provides the occasion for sharing, for comparing, and for cooperating. That's where coordination comes in. If you have children who have difficulty communicating or have no need to share or communicate, this is a sign that intellectual development is very sluggish.

Piaget doesn't distinguish between behavior and knowledge. All behavior has some knowledge. You can't behave without any knowledge. All knowledge is that you do something. The split between action and thinking to behavior and knowledge is a senseless split. Knowledge doesn't arrive the day that somebody writes a book. Knowledge is always there. Intelligence is what makes you a human person. Now any human act, such as a little baby crawling from here to there, means that this baby has some knowledge. Piaget calls it sensory motor knowledge. To crawl from here to there the baby has to have spatial knowledge and knowledge of coordination. What is called abstract knowledge is not so different. Because you understand Piaget's theory, it means you know how to relate to other things and how to apply your understanding. You use it, just as a child uses spatial knowledge to crawl from here to there. Knowledge is not simply knowing the right answer, but it's knowing how to use it or what to do with it.

Playing is not high-level thinking, it is the product of past high-level thinking. The child has started something and now the child wants to use this thinking and play with it. That's normal when you see children playing. That's a healthy sign of being intelligent. I remember once I was driving a car and my son wanted to understand something about geography that he could drive from New Jersey to Geneva, Switzerland. I tried to

explain to him that geographically it is impossible to drive a car from New Jersey to Switzerland. I thought, when we get home I'll use the globe to show this to the child, so an hour later when I got home, I said, "Now come here, Paul, and I will show you this." He looks at me. He wasn't interested. You see he was interested an hour ago, but I didn't have the medium. And an hour later he wanted to play or to see his family. So we can't always program a high-level situation. We can encourage the child, but if the child doesn't want to do it, he won't be receptive.

You can't force a person to do high-level thinking. On the other hand, if you have a child who says to you, "Daddy, I know how a car works. It's because you press on that, and you push it forward." But if you say, "What a silly child you are," then you discourage the child's thinking because this is the product of the child's thinking. You can discourage the child, particularly as a teacher. If you tell the child there's just one right answer and everything else is silly, then the child quickly shuts up and never dares to do high-level thinking, because high-level thinking means that you're bound to make mistakes. There is no other way to do high-level thinking. So, there's nothing wrong with mistakes. What's wrong is if you give up.

Finally, probably it's clear to you that it isn't the question of having the right words, such as knowing the word acceleration, that counts. What really counts is understanding the mechanism. When you understand it has some kind of an engine that works. All these things seem to work themselves out. I'm not saying that words are completely unnecessary. If you think I understand Piaget's theory, but all you happen to remember is my words, you will never understand Piaget's theory. The theory is not in words. The theory is in understanding.

Play activity is usually not high-level thinking. You can create a fantasy that would be high-level. Like if you want to create a work of art, if you want to act. Acting out a scene of riding on a bus, for example, is high-level thinking. Children act out things and try to understand how things work. If a child usually plays car, the child isn't really interested in how a car works, but the child enjoys some things in connection with cars. Whereas, if you tell children to act out driving a bus, then you are constrained by what the bus is, and the good coach will notice whether a child shifts gears all the time, because in reality you also shift gears all the time. You see, that's different because there is a goal. As soon as there is a goal, then you apply that intelligence to that goal. That could be high-level thinking. But when you play cars, your goal is not to understand the car, the goal is to enjoy one's life. And that is not high-level thinking.

Piaget is trying to point out that intelligence develops because it is in the nature of intelligence to be active. Any extrinsic motivation is merely facilitative, but it can never be causative. It doesn't mean that the environment doesn't play a tremendously important role. The environment can hinder knowledge just like with health. Obviously, you can have a healthy environment and you can have a healthy diet. But basically, it is what your body does with it that counts. It is the same with intelligence.

In general, the child's view of the world is very confused. Take the nature of obligations, for instance--things that must be. A child will think that whatever is, must be. It's hard for children to understand what is just chance, what is logical necessities, what is moral necessity, what is physical necessity. All these things are unknown to the child. Realize that 3 + 4 = 7. That's called a logical necessity to us. We know, for instance, that we get up at 7:00 in the morning; for all we know we could get up at 3:00 in the morning. It's arbitrary, but at least we know some reason, but for the children all these things that happen are equally necessary. That is why a child's world is so very, very different. What I want you to get used to is that we have to look at the world with a child's eyes, with a child's mind. This is really the type of thing that Piaget has done. This is why he has talked about knowledge. How does knowledge develop on the inside? When we talk of knowledge, we usually think in terms of the finished product, and how we impart that knowledge. Piaget tried to find out how this knowledge developed from within the child, because all knowledge has once developed from the subject. So, I want to now talk about stages that relate. I want to stress this notion of how the world looks from the child's viewpoint.

Remember I said to you that intelligence is what makes you a human being. Your reality is a response to your intelligence. This is the relationship between the person and environment. If reality is your environment, this reality is a function of what you are as an intelligent person. Now the reality of the child is different, because a child has a different kind of intelligence. The child hasn't developed the categories by which we devise reality to physical reality, fictional reality, logical reality. The most basic distinction that we accept as a matter of fact is the bare distinction that is implied in the sentence, I see a window. When you say, "I see a window," you distinguish yourself as a person from the window which you see or which you know. Now this distinction is a distinction that is unknown to many men. It's a distinction that is unknown to animals. It is very hard for us to grasp because we are so used to saying that the object is given and I am getting conflict from the object. We have to understand that knowledge arrives from action. For example, the infant wants a ball. Looking at the ball, the in-

fant wants to get the ball. The infant doesn't distinguish wanting the ball from getting the ball from seeing the ball. Adults make all these distinctions. The child lives with the present. The infant sees the ball and then reaches for it and goes for it. That's sensorimotor intelligence. Sensorimotor behavior. From an adult viewpoint, we distinguish the ball from the child. The child says, "Here I am. I live here. I act here. I act towards the ball." And all this is confused. It is only knowledge that separates our infant from the ball from the action. This separation takes place at the preoperations period. The main stages of development are the instinctual level, the sensorimotor level, and the conceptual level. The conceptual level can be distinguished into preoperations. This is Piaget's terminology--concrete operations and formal operations.

I want to say a few things in connection with the stages. Usually it is not a child or a person who is in a stage. What is in a stage is a particular knowledge. It sounds silly to say you are in a formal operational stage, because the only way to sit down is to do it sensorimotorically. It is an understanding that is in that stage. So, don't say a child is in a stage, because that depends on the situation. The instinctual process that are in human beings usually relate to biological physiological things. Instinct is really innate. That's where the word innate comes in. You have an innate constitution. It can be affected by things, but by and large, this is what you are born with. I want you to see how sensorimotor is distinguished from instinct and how it differs.

Sensorimotor means that the organism or the person learns from individual experience. That is where the word intelligence comes from. I don't say I am intelligent when I digest, because this is intelligence of the species that is not my intelligence. But when a toddler steps on a table to reach something, you'll say that's intelligence. That's sensorimotor intelligence. That's the beginning of human intelligence. What distinguishes sensorimotor intelligence from innate qualities is that you benefit from past experience. You learn to develop. You acquire things. We are not used to using the word intelligence in connection with sensorimotor activity, but I can assure you that there are many high-level developmental experiments that relate to sensorimotor activity. For instance, for a child to be able to walk backwards from one place to another is called sensorimotor intelligence.

Is there memory in sensorimotor behavior? Finding a hidden toy. Is that sensorimotor? Remembering that this toy is in this box and not in another box. Isn't that memory? Here is a 10-month-old child capable of remembering that a certain toy is in this box and not in another box. Is a dog able to do this? Yes. What does sensorimotor memory mean? Sensorimotor memory is

recognition memory. All of you must have experienced going to a place and knowing how to find a particular place while you drive your car. You couldn't have told me how to get there. Once you are there, you know how to move around. That's the difference between recognition memory and recall memory. Sensorimotor memory is not recall memory. A toddler cannot recall a toy, but he or she does know how to behave in a present situation based on past experiences. So there is sensorimotor intelligence. I want you to think very highly of sensorimotor intelligence.

Sensorimotor behavior is intelligent behavior in the presence of the object. Communication is related to the present situation. I want food. That is sensorimotor communication. We know these chimps who learn sign language. So the chimp would be shown a banana and given the sign for banana. He would sign "I want a banana" when he wanted a banana. Human language is more than communication on a sensorimotor level. I say if the chimp tells you that yesterday he ate a good banana, this is language because we don't need to refer to a present banana. But if you say "My stomach wants a banana," then you are referring to a present thing. When you talk about yesterday's banana, that is a symbol. But if you say "I want a banana," that's a sign, that's a signal. Sensorimotor behavior has signals. Now, think for a minute about this object concept. In a sense, if you understand the object concept, you will understand Piaget's theory.

Hans Furth, Ph.D
Catholic University of American
620 Michigan Avenue, N.E.
Washington, D.C. 20064

This is a transcript of a presentation, not a formal paper.

APPLICATION OF CONCEPTS OF SENSORIMOTOR DEVELOPMENT TO COGNITIVE DEVELOPMENT OF DEAF-BLIND CHILDREN

Cordelia C. Robinson

Cognitive development in this paper will involve a discussion of Piagetian sensorimotor development. While there are several prominent theoretical points of view regarding cognitive development, a unifying characteristic of the theories of acquisition of cognitive development is that all regard cognitive development as basically including the development of concepts or classifications of environmental events and strategies for responding to those classifications. Different approaches may involve a variation in definitions of "concept"; however, the essence of most definitions includes the idea that evidence of a concept involves a class of environmental stimuli or events being responded to as the same, despite difference in some characteristics. An example of a sensorimotor concept is object permanence. Evidence that children have the concept of object permanence is found when they will search for an object in which they are interested when the object has been removed from their sensory, visual, auditory, or tactile contact. Initially children might search for only one or a few select objects in one or two places and only immediately after they have lost sensory contact with the object. Children who will search under only very specific conditions are in the beginning phases of acquisition of the concept that objects and people are permanent in their existence independent of their action upon them. When children will look for any object in which they are interested in several possible places until they find the object and after increasing lengths of time between their last contact with the object and the beginning of their search for it, perhaps up to several hours, then one can say that these children have a generalized concept of object permanence.

Another characteristic of responses identified as evidence of cognitive development is the use of strategies or rules which govern responses across situations. Examples of strategies in the area of sensorimotor development include a search strategy of looking for an object where one last saw that object, or the means-end strategy of repetition and refinement of a response which produces particular events.

Sensorimotor Period

The sensorimotor period, as described by Piaget (1954, 1963) encompasses the period from birth to 1½ to 2 years of chronological age in children demonstrating an average rate of development. This period is frequently characterized as the period of practical intelligence or motor intelligence. This characterization follows from the theoretical position that much of the child's accumulation of concepts and strategies during this period is derived through active physical exploration and manipulation of the environment.

It is only toward the very end of the sensorimotor period that the child's language is sufficiently developed so that it becomes a significant force in directing behavior. The earlier developments during this period, such as the recognition of permanence of objects and people, direct action on objects to reproduce events, combining of objects as tools to solve problems, functional use of objects, and increasing competency in motor imitation, are all developments that are assumed to originate for the typical child as a function of daily interactions during the first two years of life.

Piaget divides the sensorimotor period into six substages involving increasingly complex levels of application of the sensorimotor concepts and strategies. Table 1 contains a listing of the sensorimotor concept areas and the level of the concepts which corresponds to each substage. More complete examples of each of the behaviors described can be found in Uzgiris and Hunt (1975).

Application of Piagetian Sensorimotor Concepts to Multiply Handicapped Children

In utilizing Piaget's descriptions of the schemes and operations developed during the first two years of life as a description of content for a cognitive curriculum for severely handicapped children, it is assumed that development, for the child who is severely handicapped, occurs in the same sequence and on the basis of the same types of experiences as development occurs for the child of average intelligence. The major difference between the two groups of children, then, is the rate at which learning takes place. Included in consideration of rate of learning is the number of repetitions, trials, or experiences with a particular event which must take place before a response is a consistent part of a child's repertoire.

The one major constraint that must be placed upon this assumption of regarding the same sequence of activities and types of experience is that a good number of individuals who are severely retarded also have multiple handicaps. Given limitations on responding imposed by motor or sensory handicaps and neurological damage resulting in seizure disorders, the type of experience typically used to facilitate development of object permanence, means-end and causality concepts, imitation, and functional use of objects may be unavailable to the child who is severely handicapped.

The benefit of basing a curriculum upon concepts and strategies rather than a sequence of skills becomes apparent at this point. If understanding that objects still exist when they are out of direct sensory contact is the objective, rather than searching under cups and towels, then a basic curriculum sequence is applicable and the modification necessary for the multihandicapped child is simply modification of the operational definition of the response that indicates the concept to the child's response repertoire.

Object permanence, for example, typically has been operationally defined as uncovering and obtaining an object that has been covered. This particular operational definition makes it a concept that cannot be demonstrated by a number of our severely handicapped students because the prerequisite skills of visually directed reach, grasp, and visual tracking are ones that even after hours, days, and months of work are not possible for them, due to abnormal persistence of certain early reflex patterns, such as the asymmetric tonic neck reflex or abnormal muscle tone in neck and trunk that makes coordination of reach and grasp or visual tracking impossible. If one persisted with only one operational definition of the concept of object permanence, one would still be working on the prerequisite behaviors for that operation. Regarding object permanence, object permanence is a recognition on the part of individuals that although they no longer have sensory contact (sight, touch, or hearing) with an object, that object still exists. The behavior from which one infers that a child has the concept of object permance does not have to be visually directed reach and the uncovering and grasping of an object. Persons who are unable to reach and uncover and grasp due to physical constraints might tell someone else, "It is under the cup to my right," or "It is under the red piece of cloth." However, if in addition to physical limitations a person could not talk, that person might tell someone the location of the desired object by looking in the direction of that object. Thus, there are alternative responses from which one can infer the presence of the concept of object permanence in a person who is physically incapable of the response required in the more conventional manner of assessing the concept. While it is certainly true that this strategy of adapting a response to the person's physical abilities is a strategy that can be applied to any content area, this adaptation is carried out more readily when the curriculum is organized around the teaching of concepts rather than working through a behavioral checklist of skills arranged in an empirically determined hierarchy, such as the items involved in standardized infant assessments or checklists. While infant assessments can be adapted, and there are people working on systematic adaptations of scales for the physically handicapped, to do so one must first go through the steps of analyzing the concept the item is measuring before one can analyze the task and select an alternate response.

The purpose of assessment (Robinson & Fieber, 1974) is to obtain prescriptive information for a child's educational plan. In developing an individual educational plan the primary question to be considered is the behavior of a given child. The critical test for inclusion of any objective, and the activities for meeting that objective, in a child's educational plan is whether that objective will increase the child's competence in his or her daily interactions within the home, school, and play environments. At one level one might say that all the typical preschool activities increase a child's competence. However, if pressed for specifics regarding the manner in which puzzles, bead stringing, and color sorting relate to activities that come later in a child's curriculum, one might not be able to provide them. Time spent on teaching behaviors that are questionable prerequisites to tasks that may

not be physically possible for a child is wasteful and functional instructional time is very precious to these children. Selection of instructional activities should be based upon an affirmative answer to one or both of the following questions: Does the behavior I am teaching this child provide or build toward a behavior which gives additional control over the child's physical environment? Does the behavior I am teaching this child provide or build toward a behavior which gives additional control over the child's social environment? If it is not possible to answer yes to either one of these questions, there is no justification for the activity in the child's program.

The reason for placing this emphasis upon increasing the child's control over his or her environment comes from the growing body of literature on the topic of "learned helplessness" (Seligman, 1975). This term refers to the phenomenon which results from placing an organism in an environment over which it has no control, typically an aversive situation from which it cannot escape. This description frequently applies to situations in which moderately to severly handicapped infants and toddlers are placed. In some cases their limited mobility, sensory capabilities, motivation, or a combination of the three, result in children who have few opportunities to act on their environments in a systematic manner even if the acting is something as simple as swatting their hands at a wind chime. If a child's overall rate of movement is low, and the number of repetitions that are required to bring a response under discriminative control is great, every possible opportunity for learning a response should be taken to advantage.

For example, with a child who displays no evidence of repetition of a response, be it arm wave, foot kick, or head turn, which results in occurrence of a visually interesting or sound-producing event, the first major goal will be development of some form of this behavior. The specific stimulus, response, or reinforcer, is not important; what is critical is that there is a relationship established between a behavior on the child's part and some predictable occurrence in the child's environment. While it may be related to only a very minute aspect of the environment initially, the child will have some opportunity to exercise control. This basic relationship can then be extended by planning other activities for the child's day over which he or she can exercise control. It has been the author's experience that before long children will invent their own opportunities for generalizing this strategy. This initial very basic response strategy can then be extended over an increasing number of daily events, thus providing the child with a series of very predictable occurrences throughout the day. It is in the context of these predictable events which require specific action from the child that the concepts of object permanence, means-ends activities, causality, specific actions on objects, and spatial relationships can then be taught.

The second criterion for inclusion of objectives and activities relates to the aspect of interaction with the child's social environment. In this context we are speaking of the same type of response-event relationships for children that were described for the development of control over their physical environments. The two types of events are separated only to place additional emphasis upon the need for these basic events.

During the initial development of our curriculum activities, we placed a great deal of emphasis upon the manipulation of the physical environment, but somewhat neglected social interaction. After many hours of observing and working with children we have recognized this error and are now trying to correct it. Specifically, we see communication as a basic strategy that develops and can take a number of forms (gesture, vocal, communication board). By not restricting communication to one specific mode, many more opportunities are opened for requiring and responding to different levels of communication from our children.

We see opportunities for communication (the child acting on his social environment) in every interaction that occurs with the child. For example, consider the young child who enjoys bouncing in an infant seat. This activity is provided, the activity is stopped, and the child continues to bounce a little; so Mom or Dad interprets the child's bouncing as a request to "make it happen again," and they do make it happen again. This subtle sequence can be the beginning of a communication strategy. After going through this sequence 20-30 times, the child starts to bounce as soon as he is put in the seat. Once that occurs Mom and Dad begin to require the bounce first from the child before they make the seat "go." This same routine can be applied to any and every event during the child's day. It is a very primitive form of communication, one which requires much shaping and interpretation on our part, but it is the material out of which a more formal communication system will be developed.

Interaction Between a Child's Handicaps and Areas of Greatest Functional Use

After considering the overall requirement regarding the effects of an objective on the child's control over his or her environment, the next consideration involves adaptation of an objective according to the child's specific handicaps, potential for development in a given area, and the physical requirements of the task. While a judgement that a given task will not be possible at some later time cannot always be made with complete assurance, the teacher in consultation with therapists will have to make some judgments based upon the best available information. Returning to our example of object permanence, if a given child seems to have some difficulty in hand use but it is not sufficiently poor to rule out eventual

functional reach and grasp of some ease, the teacher may choose to use the conventional assessment of object permanence, as the task provides a nice natural consequence for use of reach and grasp and is therefore a good teaching situation for two objectives, refinement of reach and grasp and object permanence. If, however, reach and grasp are so difficult for the child that efforts to reach with accuracy distract the child from the object permanence task, it will be best to use an alternative response such as directed gaze for object permanence training. The question regarding the best response system for a given child needs to be determined according to the characteristics of the individual child. The decision is based upon the information at hand and can then be revised as more information becomes available.

A task analysis of skills involved in any one objective will provide guidelines for adapting tasks to a given child's physical capabilities and sensory capabilities. If the child shows delay in the area of a particular prerequisite skill, for example visual tracking is poor but reach and grasp are adequate, then the teacher may wish to construct the object permanence task in such a way that the child can use a strategy of alternate glancing or tactile following of the movement of an object in the sequential search tasks so as not to hold the child back in conceptual progress on the basis of sensory or motor deficits. Alternate strategies for the development of communication, such as communication boards or signing systems, provide excellent examples of adapting tasks to a particular child's conceptual and motoric capabilities.

Selecting Instructional Methods

The sensorimotor period has been referred to as the period of practical intelligence because the tasks the child has to accomplish during this period are based upon direct sensory and motor experience. The term practical intelligence is useful, however, to remind us that the tasks are most likely to be accomplished when children are confronted with a problem that is solvable by them at their current level of functioning during the course of naturally occurring events throughout their day. The term "naturally occurring" in this context does not mean that teachers should function as ecological psychologists and wait for events to occur so they can record the child's response, but rather that they should arrange instructional events using the daily routine and the problems it can present as the instructional methods.

While we are generally accustomed to dividing our instructional time into segments according to content areas such as language time, arithmetic skills, art time, and gross motor activities to name just a few, such segmentation does not seem to be appropriate for the child who is functioning at the sensorimotor level. Requiring a child to search for different objects for five trials and then switching to five trials of tool use and then five trials of putting objects into a container will produce a very exasperated child,

probably because objects are constantly being taken away from him or her. An approach that is more successful is to intersperse the activities so that after children find an object or use a tool to get it, you allow them to examine it and record their schemes with that object; then you can demonstrate a new scheme and entice them to imitate you, going on to another object only after their interest in the first seems exhausted for the present time.

Instruction in causality objectives, which is most likely to be at the level of using some form of gesture--not a formal sign, but a movement that has been associated with a particular consequence--is best accomplished by making daily events around routines such as eating, dressing, toileting, and certainly any favored events contingent upon the designated gesture. Children are not picked up unless they touch the hand of the person feeding them. They don't get rocked in the rocking chair unless they tap the arm of the chair. The actual response is adjusted for the individual child.

Ambulation activities are worked on not by taking the child out into the hall and practicing walking by hanging onto the wall; instead, children must walk (roll, scoot, or crawl) to their favorite activities during the day whether that be snack time or music time or another activity that is highly preferred. This is, of course, a description of the Premack (1965) principle, that is, using a more highly preferred activity involving a behavior or higher probability to reinforce the occurrence of a less probable form of behavior. The important point to keep in mind when considering the arrangement of activities for the child functioning in the sensorimotor period is that sometimes we are talking about spending seconds instead of minutes as the length of time devoted to any one form of behavior at any one time. The necessity of making very close temporal arrangements between antecedent, response, and consequence units is probably a defining characteristic of the sensorimotor period and is perhaps the most important consideration in selecting one's instructional methods.

Procedures to Evaluate Learning

Procedures for evaluating learning in the area of cognitive development are essentially the same as used for any other content area. Generally, there are two levels to consider. The initial aspect is simply presence of absence of the skill. Many of the frequently used developmental checklists are in this form.

In order to initially set goals for a given child, we will begin with an assessment of whether he or she is able to perform a task. We will continue to assess skills or concepts in that sequence until we find something the child does not do. At the

point of initial failure, we will analyze the task and the child's responses in an effort to determine whether the problem may be the physical constraint of the task. If it is the particular response modality that seems to be the problem, we will try to modify the task to meet the child's response capabilities. If the physical demands of the task do not seem to be the problem, we will present the task using different antecedent conditions in the way of cues and prompts in an effort to find some condition under which the child demonstrates the response; we will begin teaching activities at that point, the object of which is to approximate the performance in the standard condition in as many ways as possible.

When initially assessing a child's abilities, we begin with an assessment of presence or absence of a form behavior, but eventually we have to be concerned with the level of proficiency with which the child demonstrates a particular form of behavior. Proficiency can refer to several different aspects of a form of behavior. It may refer to the generalizability of the response across a variety of stimulus conditions, or in some cases it may refer to the rate at which the response can be performed.

In the area of cognitive development we are particularly concerned with the former aspect of proficiency, the generalizability of the response across stimulus conditions. In fact, this aspect of generalizability of a response across stimulus conditions is the operational definition of a concept, and concepts are generally what we are referring to when we speak of cognitive development. Our eventual goal in working on all the sensorimotor areas--means-end, causality, object permanence, construction of the object in space, expansion of object schemes, and imitation--is to develop the concept involved, which is that objects still exist when they cannot be seen, and objects and events can be used as tools to solve problems as the child confronts more complex environmental tasks or events. How a generalized response, with respect to the sensorimotor concepts, will be accomplished must be answered individually for each child. One characteristic we can rely upon with the severely retarded person, however, is that we will have to present many, many exemplars from our classes of antecedent events before we see criterion responding for generalization or first-trial correct responding to a new exemplar of the class of stimuli. This characteristic has been evident in the literature on motor imitation training with persons who are retarded and with efforts to train learning set in persons who are retarded, to name just two of a number of documentations of this point.

When working with a child on a particular activity--the simple object permanence problem, for example--we will begin with several different objects for hiding and perhaps two different screens with which to hide objects. We start out with variety in order to try to facilitate generalization. If we find a very low rate of searching, we reduce to one screen but still use whatever variety we can in terms of the hidden object. Once the child searches under

one screen, we introduce a second, third, fourth, fifth, and so on until we see correct responding within several trials of the first introduction of a new screen. Generally, we find it is the form of the screen, cup, towel, or box as the dimension which appears to limit generalization, rather than the color of cloth or cups.

We have found, however, that the physical location or task setting is another important factor to consider in task generalization. For example, one child we worked with would search for a completely covered object placed in front of her. If the object was moved partially out of sight to the side, however, she would not pursue it, suggesting that adequate generalization on the dimension of physical location was not accomplished during the partially covered training activity. Since at any one task level it may not be possible to test adequately for generalization, problems in accomplishing objectives at the next level may help to identify gaps in generalization. Ideally, of course, it is good to put children in a natural situation where their newly learned concepts or strategies are required to solve an immediate problem. It is with successful performance under such a condition that we have confidence in the adequacy of the response as a generalized strategy.

What has been offered in this paper are a few general points to be considered when developing objectives in cognitive development for individual educational plans. While examples have been restricted to the sensorimotor period, it is felt that they apply as general principles that are pertinent throughout the stages of cognitive development.

Table 1

Sensorimotor Stages and Accomplishments in Concept Areas

Sensorimotor Stage	Object Permanence	Means-End	Causality	Spatial Relationships
I. Reflexes Slight modifications of initial reflexes, sucking, grasping, arm, leg movements occur.	No differentiation of developments in these areas. Behavior is at level of exercising reflexes.			
II. Primary Circular Reactions Reflexes undergo adaptations to environmental experience coordinations between responses, i.e., beginning looking at grasped object.	No special adaptations as yet to the vanished object, related developments during this period include visual pursuit of a slowly moving object by: 1. Following through arc of 180°. 2. Reacting to disappearance of a slowly moving object by maintaining gaze at point of disappearance.	Differentiation between means-end and causality not possible at this stage. Same initial developments for both. 1. Visual examination of hand. 2. Visually directed grasp. 3. Repetition of movements which produce environmental effect; cessation of the effect elicits a "procedure from the child." 4. Refinements in reach and grasp.		1. Switches gaze from one visual stimulus to another. 2. Turns to localize a noise made outside. 3. Looks to other end of opaque screen when object disappears at one end.
III. Secondary Circular Reactions Schemes are repeated systematically producing a change in effect on the environment.	1. Moves to look after a fallen object. 2. Searches for the hidden object. 3. Returns gaze to starting point when a slowly moving object disappears. 4. Searches for object under single screen.	1. Moves to object out of reach. 2. Pulls a support, obtains a toy attached to the support.	1. Responds to cessation of a spectacle that he cannot reproduce by touching the adult or the toy.	1. Follows movement of rapidly moving object. 2. Rotates trunk to retrieve object moved behind him. 3. Examines objects by turning them over, exploring parts.

154

155

Table 1

Sensorimotor Stages and Accomplishments in Concept Areas

Sensorimotor Stage	Object Permanence	Means-End	Causality	Spatial Relationships
IV. Coordination of Secondary Circular Reactions Schemes are used together for intentional results.	Finds an object hidden under one of two screens by searching directly under the correct screen up to three or more screens	Does not pull support if object is held above it. Expands pulling scheme to other tools such as strings both horizontal and vertical (vertical use requires object permanence as object is not in view).	Responds to cessation of a spectacle by handing the toy to the adult. Makes first try to reproduce the spectacle by direct action on the toy.	1. Brings functionally related objects together, i.e., cup and spoon. 2. Begins container play by taking an object out of container then places one at time, building to sequencing several objects into container.
V. Tertiary Circular Reactions Through trial and error procedures discovers new means to obtain desired goals; this requires combination of previous schemes.	Finds an object through a single invisible displacement Follows objects through a series of visible displacements and searches in correct location. Finds an object hidden from view and taken through successive displacements. Child searches along path taken.	Uses an unattached tool such as a rake to get an object.	Lets the toy continue activity without intervention, attempts to activate the toy after demonstration.	1. Empties container by dumping. 2. Moves around barriers to obtain objects. 3. Builds a tower of blocks.
VI. Invention of New Means through Mental Combinations Child is assumed to solve problems representationally and then applies solution to problem situation.	Complex problem; object is left in first location and the examiner's hand moved through the entire path, the child is expected to search systematically until he finds the object.	Solves problems through "foresight," for example, does not attempt to stack a solid ring on a pole, moves chair over to counter where cookie jar is kept; climbs up to jar.	Spontaneous attempt to activate the toy by mechanical means; i.e., winds up toy.	Recognizes absence of familiar persons.

References

Piaget, J. The construction of reality in the child. New York: Ballantine Books, 1954.

Piaget, J. The origins of intelligence in children. New York: W. W. Norton and Company, 1963.

Premack, D. Reinforcement theory. In D. Levine (Ed.), Nebraska symposium on motivation. Lincoln, Nb.: University of Nebraska Press, 1965.

Robinson, C. C., & Fieber, N. M. Development and modification of Piagetian sensorimotor assessment and curriculum for developmentally handicapped infants. Paper presented at Annual Meeting of American Academy of Cerebral Palsy, Denver, November 1974.

Seligman, M. E. P. Helplessness: On depression, death and development. San Francisco: W. H. Freeman and Company, 1975.

Uzgiris, I. C., & Hunt, J. McV. Assessment in Infancy: Ordinal scales of psychological development. Urbana: University of Illinois Press, 1975.

Cordelia C. Robinson, Ph.D
5910 North 52nd Street
Omaha, Nebraska 68104

PREVOCATIONAL

A PREVOCATIONAL PERSPECTIVE
MAXIMIZING ALL ASPECTS OF ADJUSTMENT

Frank Simpson

As an introduction and a perspective to begin our dialogue on prevocational services for persons who are severely multihandicapped, I am using some of the summary information from an article by Baker and Sawyer (1978).

Just as education has been given an expansive definition to make it appropriate and relevant for multihandicapped persons, so must work and rehabilitation become more inclusive to be meaningful for this group of special people. Work is but one component of daily living that leads to a meaningful maximally functioning existence. Skills leading to maximum personal independence, improved social and family relationships, meaningful use of leisure time, increased mobility within one's environment, and enhanced psychological adjustment are equally important goals of the rehabilitation process. Work adjustment and vocational placement simply cannot be dealt with in isolation. Likewise, a meaningful prevocational program cannot just teach sorting fabrics or assembling bicycle brakes. It should facilitate growth in all areas of personal and social adjustment.

Baker and Sawyer (1978) have defined social, personal, and community adjustment as follows:

> Social adjustment deals with the acquisition of those skills that would help a person participate as an effective member of a group.
>
> Personal adjustment deals with problems of appearance, hygiene, personal mannerisms, and behaviors that contribute to a positive or negative perception of the person by others.
>
> Community adjustment deals with the problems persons have entering or re-entering the community such as transportation, money management, shopping, use of community resources, etc.

Many multihandicapped individuals who are currently enrolled in special education programs in public, private, or institutional settings will not succeed in a work environment unless on-going emphasis is placed on social, personal, and community adjustment. We have all heard stories about students or clients who leave training programs with excellent work skills but who fail in a placement due to lack of appropriate personal or social skills. Perhaps we often discuss students in our programs, citing their excellent hand skills but knowing success in most work environments is doubtful considering the inappropriate behavior exhibited.

For these reasons we must be very careful to plan and implement prevocational programs that are broadly based, stressing not only psychomotor development but also cognitive and affective development. Plan programs to include as many relevant services as possible. Take a look at a variety of evaluation reports from rehabilitation centers and see what areas are covered. Lee Hagmeier has included in Prevocational Stepping Stones for Deaf-Blind Persons a comprehensive list of characteristics of deaf-blind persons needed for success in work activity centers, sheltered workshops, and competitive industry. Volume III, Vocational Skills Evaluation, from the Massachusetts Center for Program Development and Evaluation, also lists similar criteria.

Program planning must be flexible and on-going. The individual educational plan should assure that prevocational goals are relevant to each child. Evaluation should also be built into the program. It's not so critical that standardized assessment tools be located prior to beginning a prevocational program. Entrance criteria are relevant to the individual program and child. However, you should be aware of a variety of assessment systems in order to assure content validity in your locally developed instruments.

D. E. Mithaug has written several articles that focus on developing prevocational programs for severely and profoundly handicapped young adults. He cites the following procedures (Mithaug, 1977) as critical in the development of a successful program:

> The procedures considered critical to the development of a successful program included: 1) surveying potential placement opportunities in the community, 2) selecting probable placements that are appropriate for a given client, 3) assessing the job requisites for entry into that setting, 4) assessing the client's skill competencies and deficiencies with respect to those entry level requirements, 5) developing training objectives that focus upon reducing identified deficits, 6) selecting training tasks (curricula) that will develop needed skills, 7) identifying instructional tactics that will facilitate skill acquisition, 8) identifying behavior management strategies to reduce and eliminate behaviors incompatible with work, 9) developing a measurement system that accurately reflects progress towards these objectives, and 10) developing and specifying decision rules for concluding about day to day, week to week, and month to month progress towards the objectives.

Mithaug, Hagmeier, and Haring (1977) present a job requisite survey that is currently being used to assess entry-level requirements of activity centers, developmental centers, and sheltered workshops in Montana, Washington, Alaska, Idaho, and Oregon. The survey form is extensive. Sixty-three items are included. On close examination many of these items include an emphasis on personal, community, and/or social adjustment, as well as on work adjustment. It becomes obvious that simultaneous development in all four areas of adjustment is essential. The analogy of "a chain is only as strong as its weakest link" deserves consideration.

Prevocational services at the New York Institute are designed to facilitate all aspects of adjustment--personal, social, work, and community. Prevocational may designate a specific program component, but is also refers to a different perspective--a new way of viewing what is already in progress. For example, many skills and habits valued and taught at home and in the classroom will also be required in a work setting. To take a prevocational perspective requires that parents and staff relate current educational programs and goals to the student's anticipated rehabilitation potential. This description of the Institute's prevocational program is not designed to give any specific answers, but rather it relates an attempt to mesh educational and rehabilitation philosophies in a residential school setting.

The Institute provides a wide range of services to a heterogeneous group of multihandicapped blind students ages 3-21 years. Of the 160 students currently enrolled, approximately 85 are deaf/blind. Deaf/blind students function on sensory motor, pre-operational,and beginning concrete levels. For purposes of program planning and grouping, six levels of developmental skills are used. At this time no direct prevocational services are provided to students who mainly function at Level I. Listed below are general prevocational goals for Levels II - VI:

Level II

Mobility to and from the "work" environment with minimal assistance.

Beginning Internalization of certain aspects of the work routine.

Through assessment (prevocational staff observations including the occupation therapist) determine student's physical and emotional assets for use in prevocational settings.

Introduction to simple packaging, assembly, and sorting activities in a simulated work setting.

Development of work tolerance to 20 minutes.

Level III

Mastery of mobility routes to and from work environment (does not involve crossing streets but may involve movement from one building to another).

Mastery of simple packaging, assembly, and sorting tasks.

Internalization of basic work routine with maximal external cues form staff and environment.

Introduction (when possible) to group work activities in simulated workshop and food service settings.

Development of work tolerance to 40 minutes.

Level IV

Mastery of complex packaging, assembly, and sorting tasks.

Internalization of work routine with minimal external cues from staff and environment.

Involvement in work study/vocational exploration activities on the school campus.

Beginning introduction to career education activties.

Development of work tolerance to 1½ hours.

Level V

Introduction to counseling readiness activity on a group basis.

Beginning involvement in community-based rehabilitation, recreation, and social service programs.

Paid work-study experience on the school campus.

Involvement in more expansive career education activities.

Development of work tolerance to 3 hours.

Level VI

Transition to community-based social, rehabilitation, and vocational training programs.

Paid off-campus work experience during school year or summer.

Increased awareness of personal assets and liabilities through individual and group counseling.

Development of work tolerance to one day (6 hours).

At each of these six levels on-going instruction in skills of daily living is provided on both an individual and group basis. If a student is functioning at the sensori-motor level, a major emphasis of the education program is development of skills of daily living. At higher levels of development the emphasis is on refinement of these skills and acquisition of social and personal skills that contribute to maximum independent functioning.

What began as a small "prevocational program" (Fall, 1973) operated by two skills of daily living staff members and two work adjustment staff members providing services to 25 adolescents has now evolved to include a variety of professional and para-professional personnel. Actual staff members currently assigned full time to prevocational program components remain small relative to the student population; however, many other staff members are actively involved. The classroom teacher or teacher's aide usually accompanies the students to the specific activity in the simulated workshop, skills of daily living apartment, coffee shop, greenhouse, print shop, or work-study site. Prevocational staff, the classroom teaching staff, appropriate ancillary personnel, educational supervisor, parents, and when possible the individual student formulate prevocational goals and objectives.

We are increasingly emphasizing affective development in all aspects of programming at the Institute. Individual and group counseling are provided when appropriate. We are striving to develop the most therapeutic school environment possible to facilitate the development of good mental health. A variety of activities are used for this purpose.

Career counseling using the simulated workshop setting, group work projects, and weekly video-taped sessions recently proved very successful. Students became more aware of appropriate work-related behavior. There was positive response to competition in the setting. Appropriate assertiveness increased. Assertive Training, Vol. II, Elwyn Institute, 1975, is a valuable resource in developing these types of activities.

Means and Akridge (1978) describe the process and content of personal adjustment. Their model is complex. However, in many of our students we are stressing the development of an awareness of feelings and the communication skills to label these feelings. This is a beginning step necessary for effectively adjusting.

Long-range planning is essential. A beginning step is to become totally aware of each student's personal assets and liabilities. This is most appropriately accomplished over a long period of time in a variety of settings including both the school and the home. Next, become aware of community resources.

At the Institute, staff and parents frequently visit sheltered workshops, rehabilitation centers, and group homes. They are developing a clearer understanding of the types of services that will be available to multihandicapped blind persons when they reach adulthood. Also, they are made aware of the lack of services in many areas.

Though work options for the multihandicapped may be limited, they do exist to some extent. However, social, personal, and community adjustment service programs are totally insufficient. The necessity to simultaneously develop programs in all four areas cannot be neglected; else the goal of total rehabilitation and the maximally functioning person cannot occur.

References

Baker & Sawyer. The development of personal, social, and communtiy adjustment programs: A legitimate mandate for rehabilitation professionals. Journal of Rehabilitation, 1978, 44 (1), 35-38.

Kappen & Zimmerman. Prevocational services for multihandicapped students. New York: The New York Institute for the Education of the Blind, 1976.

Means & Akridge. Psychological and behavioral adjustment: A model of healthy persoming. Journal of Rehabilitation, 1978, 44 (1).

Mithaug. Critical steps in developing a prevocational training program for severely handicapped young adults. Experimental Education Unit, Child Development and Mental Retardation Center, College of Education, University of Washington, 1977.

Mithaug, Hagmeier, Haring. The relationship between training activities and job placement in vocational education of the severely and profoundly handicapped. A.A.E.S.P.H. Review, June, 1977.

Frank Simpson
The New York Institute for the
Education of the Blind
999 Pelham Parkway
Bronx, New York 10469

PREVOCATIONAL PROGRAMMING

David Aaron
Patricia English
Frank Simpson
Arlene Stein
Gretchen Stone

The Texas Education Agency invited one faculty member from five different schools that serve deaf/blind children to participate in a panel discussion that focused on Prevocational Programming. Each participant was sent a questionnaire that asked for a description of the school's program, a description of the participant's past experience, and a definition of "prevocational activity" and "work." Answers to these questions provided background material for those listening to the panel presentation.

Each participant was asked eight questions related to prevocational education. These questions were discussed at the conference.

The background questions and the eight questions related to prevocational education follow. Each question will be presented, and it will be followed by the answers provided by the five participants.

1. What is available at your facility in the area of prevocational curriculum?

   a. Nature of the Curriculum

      New York Institute for the Blind--The Institute provides a wide range of services to a heterogeneous group of deaf/blind students ages 3-21 years. Approximately 85 deaf/blind students are currently enrolled. Students function on sensorimotor, preoperational, and beginning concrete levels. For purposes of program planning and grouping, six levels of developmental skills are used. At this time no direct prevocational services are provided to students who mainly function at Level I. Listed below are general prevocational goals for Levels II-VI:

      Level II:
      (a) Mobility to and from the "work environment with minimal assistance

      (b) Beginning internalization of certain aspects of the work routine

      (c) Through assessment (prevocational staff observations, including the occupational therapist) determination of student's physical and emotional assets for use in prevocational settings

      (d) Introduction to simple packaging, assembly, and sorting activities in a simulated work setting

      (e) Development of work tolerance to 20 minutes

      Level III:
      (a) Mastery of mobility routes to and from work environment (does not involve crossing streets, but may involve movement from one building to another).

      (b) Mastery of simple packaging, assembly, and sorting tasks

      (c) Internalization of basic work routine with maximal external cues from staff and environment.

(d) Introduction (when possible) to group work activities in simulated workshop and food service settings

(e) Development of work tolerance to 40 minutes

Level IV: (a) Mastery of complex packaging, assembly, and sorting tasks

(b) Internalization of work routine with minimal external cues from staff and environment

(c) Involvement in work study/vocational exploration activities on the school campus

(d) Beginning introduction to career education activities

(e) Development of work tolerance to 1½ hours

Level V: (a) Introduction to counseling readiness activities on a group basis

(b) Beginning involvement in community-based rehabilitation, recreation, and social service programs

(c) Paid work study experience on the school campus

(d) Involvement in more expansive career education activities

(e) Development of work tolerance to 3 hours

Level VI: (a) Transition to community-based social, rehabilitation, and vocational training programs

(b) Paid off-campus work experience during school year or summer.

(c) Increased awareness of personal assets and liabilities through individual and group counseling.

(d) Development of work tolerance to 1 day (6 hours)

Harlandale Independent School District--The Harlandale Deaf/Blind and Multihandicapped Center is sponsored by the Harlandale Independent School District in San Antonio. The Center is currently serving 27 children who range in age from 4 to 19 years old. The Center employs 5 teachers, 10 aides, and 1 director.

The prevocation department includes 10 children ages 11-19. Two teachers, in a team effort, provide learning situations for self-help skills, cooking, and academics, as well as workshop-related skills. The children served by this team are all low-functioning retardates, each with a secondary impairment which excludes them from regular special education classes. Most of the secondary involvements are physical in nature, i.e., degrees of vision and hearing impairments and orthopedic disabilities. The students' abilities include some vocalization, little comprehension through sign language, manipulative abilities such as twisting nuts onto bolts or folding paper to place in an envelope, and other expected concurrent skills. Self-help skills are adequate for the most part.

Dallas Regional Day School for the Deaf--The Dallas Regional Day School for the Deaf serves approximately 300 deaf students in the Dallas area; 56 of these students are deaf multihandicapped. Of these 56, five are classified as either deaf/blind or deaf visually impaired.

The deaf multihandicapped curriculum covers the areas of daily living skills and fine and gross-motor development. Prevocational training, a spiraling counterpart of fine and gross-motor skill development, and work adjustment are added to the curriculum on an individual basis as children become developmentally ready to handle simulated working experiences.

Callier Center--The three areas of training considered as major goals of the prevocational program at the Callier Center are communication skills, specific work-related skills, and nondisruptive behavior. Due to the severely limited skills of the deaf/blind students at the Callier Center, initial program efforts emphasize behavior shaping. As the student becomes more independent, the approach used with the student will shift to specific work related training.

Texas School for the Blind/Annex--The Deaf-Blind Annex is a residential school which is part of the Texas School for the Blind. The Annex was established 6 years ago. Currently 32 children are being served, ranging in age from 5-14 years old. Of these 32 children, 27 are involved in the formal prevocational program, which specifically trains work skills. The program includes a developmental skills section in which 11 children, who are able to tolerate a minimum of 5 minutes and a maximum of approximately

15 minutes of work at a table, perform 2-5 minute tasks. 1:1 staff ratio is necessary. These children all have voluntary grasp. They are largely evaluated as being in the sensorimotor period of development.

The remaining 16 children demonstrate preoperational, beginning concrete cognitive skills. They work for 1-1½ hour sessions with a staff ratio of 2:4. They are able to perform a variety of packaging, assembly, and sorting tasks. Some have also mastered simple work routines and certain work behaviors.

The Annex has one half-time prevocational coordinator who works directly with all children in conjunction with the child's teacher and some child care workers.

b. Where Curriculum was Developed

New York Institute for the Blind--My main involvement is in the area of prevocational program planning and implementation.

Harlandale Independent School District--As the prevocation workshop instructor, I came to the program with a B.S. degree in education, and an endorsement in secondary education, education for the mentally retarded, education of the emotional disturbed, and education of the severely/profound (in process). I have worked with different levels of special education for eight years and have completed work for a master's degree in educational management.

Dallas Regional Day School for the Deaf--I have had public school experience as a teacher of the deaf and deaf multihandicapped in all subject areas. Having taught lower-achieving students, I was responsible for initiating career development course work for the deaf in the Dallas Independent School District. I served as program facilitator for two years at the middle school for the deaf from 1974-76. In August 1976 I became the Career Development Program Facilitator for the Dallas Regional Day School for the Deaf.

Callier Center--As an only child of blind parents, Mrs. English has had a lifetime of experience with the blind.

Mrs. English worked with the deaf for 5 years, 2 years as counselor with multihandicapped deaf adults at the Hot Springs Rehabilitation Center, Hot Springs, Arkansas, and 3 years as Behavior Modification Specialist at Callier Center for Communication Disorders.

For the past four years Mrs. English worked with deaf-blind youth and adults. Currently Mrs. English is a prevocational instructor at the University of Texas at Dallas, Callier Center, and consultant for the Texas Education Agency Regional Deaf/Blind Center to programs serving deaf/blind and multihandicapped students.

During a recent national conference, Mrs. English was elected to the executive board of the American Deafness and Rehabilitation Association, Texas chapter.

Texas School for the Blind/Annex--Experience of Prevocational Coordinator, Gretchen Stone. Four years at Deaf-Blind Annex, Texas School for the Blind. M.Ed. in rehabilitation counseling, U.T./internship with Commission for the Blind, Texas. O.TR. in physical disabilities at a rehabilitation hospital (Shoal Creek, Austin). O.TR. at Austin State Hospital-interphase-life adjustment program-ADL and work tolerance socialization activities. O.TR. University Hospital at Ann Arbor - rehabilitation and work adjustment units.

c. Who Curriculum Serves

New York Institute for the Blind--No specific answer provided.

Harlandale Independent School District--Prevocational activities or curriculum at the Hanlandale Deaf/Blind and Multihandicapped Center are directly related to potential job skills which will be found in sheltered workshops such as Light House for the Blind, Goodwill, or MHMR workshops. These potential work opportunities have been analyzed and their components set into different hierarchies. Each small component becomes an educational objective. The taxonomy of these objectives becomes a learning ladder for the student to climb toward work or job readiness.

Other prevocation tasks are intrinsic as marketable skills, i.e., stuffing envelopes, collating, conveyor belt assembly, wrapping packages, etc.

Dallas Regional Day School for the Deaf--"Prevocational activities" are experiences which ready the student for a productive adult life and teach the student the meaning of work. These prevocational activities are taught primarily in a simulated workshop setting. Reward systems are established based on a token economy. A prevocational activity becomes actual "work" when a student is paid money for a job he or she has performed.

Callier Center--Work-Activity in which one exerts strength or facilities to do or perform something.

The labor, task, or duty that affords one his or her accustomed means of livelihood.

A specific task, duty, function, or assignment which is often a phase of some larger activity.

Prevocational Activity-Training activities which teach general and specific skills, habits, and attitudes which are required or desired for a later vocation.

Texas School for the Blind/Annex--Prevocational activity-developmentally appropriate experiences and tasks which are directly supportive of work behavior and skills for optimum life adjustment.

Work-effort which results in remuneration, either monetary or otherwise contributes to support of self or others.

The kinds of skills and behaviors required of adults in productive settings.

2. What is being done in the area of prevocational planning for the student who, regardless of chronological age, is functioning on a sensory motor level?

New York Institute for the Blind--At the Institute prevocational planning is one aspect of long-range planning. At least 50% of the deaf/blind students function on certain aspects of the sensorimotor level. Within the school setting these students are being programmed for in smaller units often set up to meet particular needs. More effort is being made to focus on affective development, since motor skills (as a rule) are on a more highly developed level. For prevocational programming with many of these students, affective development (work habits), as opposed to skill development (work skills), is also being taught and will continue to be stressed. Big questions exist as to the types of resources that will be available for housing, transportation, mental health services, and recreation when many of these students leave the school setting. Actual work settings (i.e. sheltered workshops and work activities centers) already exist in many cases and if they don't exist are much easier to establish than the other services. For many students who perhaps won't meet existing criteria for entrance into a rehabilitation system or program, an alternative (or parallel system) will need to be established or located.

Harlandale Independent School District--The philosophy in Harlandale concerning prevocational training for children still functioning on a sensory motor level is that such training is yet inappropriate. The child at the sensory motor level is in need of more immediate and environmental stimuli. Curriculum for these children could, while still meeting their elementary sensory needs, be related to future learning situations which might involve projections outside their immediate environs.

Dallas Regional Day School for the Deaf--According to Piaget, there are six stages of sensory-motor development. Since prevocational training involves the readying of an individual for a productive adult life, any educational planning for a student in the sensory-motor level should include activities which will enable the student to progress through the six stages of development. Prevocational planning must include and build from the current level of functioning of each student, regardless of where that functioning level might be.

Callier Center--By definition of prevocational-unknown.

Texas School for the Blind/Annex--To my knowledge most programs begin more formalized types of prevocational training (i.e., workshop oriented skills) at the pre-operational level. Those who are working with children functioning on a sensory motor level stress attention to task, tolerance for sitting in a chair and working at a table, interest in manipulating objects, developing fine-motor skills, learning sequences, following routines, reduction of self-stimulatory behaviors through more consistent interaction with environment or through developing cycle constancy.

Other areas of instruction may include basic sorting and discrimination abilities, i.e., colors, shapes, sizes, textures. These activities are normally also taught in the classroom. If taught, in addition, in a prevocational setting, the structure, location, and approach to the task can be organized to reflect a more work-oriented atmosphere with different kinds of expectations and behaviors. Children begin to discriminate those behaviors which are required in individual settings. At the sensory motor level, prevocation has been most beneficial when integrated with classroom learning. Prevocation becomes another approach using varied materials and methods to teach the same concepts taught in the classroom.

While manipulating objects a child can learn basic assembly tasks; by working with basic spatial relationships children can learn packaging skills.

3. In regard to entrance and exit criteria, how can you tell when a child is ready for prevocational setting and how can you tell when she/he should move on?

New York Institute for the Blind--We have very few hand and fist rules for entrance and exit criteria. Often factors unrelated to the student, such as availability of staff, may determine how many or which students are involved in specific prevocational program components. An initial goal of the prevocational program is exposure to a particular program component. Inappropriate behavior may be the most frequent reason a student is not included in an activity--especially if it's a group or off-campus activity. "Moving on" is determined most often on an individual basis and the availability of something to "move on" to.

Harlandale Independent School District--In Harlandale we use a subjective appraisal to determine entrance into prevocational training. The appraisal includes the following criteria:

a. Age - generally prefer age 12 and over

b. Muscle tone - should be able to sit erect and have grasping abilities in at least one hand

c. Fine motor skills - simple use of opposing digits

d. Self-help skills - have at least 80% proficiency in self-feeding, toilet needs, and dressing

e. Communication - can relate simple needs, i.e., toileting or acquiring help in completion of a task

f. Mobility and orientation - can negotiate self within a room with only partial assistance and can locate needed materials for task when they are placed before him or her

g. On task abilities - will maintain task behavior for at least 5 minutes

Exit criteria are as follows:

a. Age - 16 or over

b. Fine-motor skills - must be able to manipulate nuts and bolts, fold paper, and complete simple assembly tasks

c. Social skills - self-sufficient in all toilet, feeding, dressing, and cleaning needs; can interact appropriately with co-workers; disruptive behavior should be at a minimum

d. Communication - relate personal needs, ask for assistance, indicate when task is completed, comprehend signed or verbal instructions

e. Concepts - demonstrate an understanding of "on, off, top, bottom, big, small;" can sort items by color, size, or function

f. On-task ability - should be able to maintain task behavior for at least 30 minutes

Dallas Regional Day School for the Deaf--Since prevocational skills in the Dallas Regional Day School for the Deaf are initiated at the primary level, entrance criteria for such training are based on the mastery of self-help skills. Prevocational training, provided it is started at an early age, can usually be coordinated with a beginning work adjustment during the later years of the educational process. A student is able to complete prevocational training and move into the total work adjustment experience when he or she shows ability in the following areas: attending work situations for an established amount of time, understanding and having a desire for monetary reward for accomplished job tasks, acknowledging pride in one's own work, functioning emotionally in a work setting.

Callier Center--At this time, it is a subjective decision. There are no valid entrance criteria. Exit criteria should be the entrance criteria for the next higher program.

Texas School for the Blind/Annex--This is a very individual matter relative to each setting. The developmental levels of your population and your resources must be considered. It is my personal philosophy that

a child is ready for some types of prevocational programming once he or she has voluntary grasp and can sit at a table for 5 minutes. Just as it takes most of us all our growing years to develop work tolerance, behaviors, and skills, so it takes at least as long for SPH children. I don't think that we should prejudge a child at, say age 10, and say he/she has no prevocational potential. Try programming with a prevocational orientation for a few minutes a day and measure the results. It's often rewarding.

When a student should move on, unfortunately, is mostly determined by what is available the next step beyond. A student usually "graduates" as soon as someone else will take him or her and it's appropriate. It's helpful if the exit-level criteria of the program closely approximates connecting services entrance criteria.

4. What has been the fate of graduates from your program? Where are they now; what are they doing?

New York Institute for the Blind--There are 9 students that I have worked directly with who have reached age 21 years and have "graduated" from the deaf/blind program at New York Institute for the Blind during the past six years. Placements are as follows:

1 Student - Home Baby-Sitter

1 Student - Albany Association for the Blind - Sheltered Workshop Placement

2 Students - Helen Keller National Center - currently involved in a long-term evaluation and training program

1 Student - A.H.R.C., Riverhead, N.Y. - Work Activities Center

1 Student - Living at home - no program at present time

2 Students - Currently being referred to Helen Keller National Center for possible summer (1978) entry

1 Student - Currently referred to Pioneer Activity Center, Syracuse, N.Y. for group home and work activities center

Harlandale Independent School District--Our prevocation program began four years ago with young children. One child moved out of the district and is supposed to be placed in a sheltered workshop soon. Three other young people are now in my estimation ready for placement.

Dallas Regional Day School for the Deaf--Although no deaf/blind students were enrolled in the 1976-77 graduating class, many of the students were either low achievers or multihandicapped. Twenty-five of the 26 graduates are either employed in competitive employment and rehabilitation centers or are enrolled in trade schools, junior colleges, or universities. This success rate can be attributed solely to the increased emphasis on career development and the addition of a full-time vocational adjustment counselor to the Dallas Regional Day School for the Deaf staff.

A survey of Dallas Regional Day School for the Deaf graduates during the 1975-76 school year showed that 20% of the students were employed; 80% were either sitting at home on welfare or the parents were caring for them. After results of this survey was tallied, traditional educational modes were combined with vocational and career conceptual development.

Callier Center--Fate? I'm not sure of their fate, but they have continued to make progress since leaving.

Three students (what you would call graduates)

Advanced School Programs - 2 in Dallas, 1 in Denver. One of the three is now working half time at Goodwill and half time at school. All three are still living at home.

Texas School for the Blind/Annex--We have had no graduates, largely due to the fact that our oldest child is 14.

5. How can the classroom teacher work more effectively with the prevocational teacher or coordinator (and vice versa) to facilitate total educational programming?

New York Institute for the Blind--In our setting either the classroom teacher or teacher's aide accompanies the deaf/blind student to the prevocational activity. In fact, in many cases the teacher plans and implements the prevocational activity. I still argue that "prevocational" is more a perspective or a long-range view rather than a set of specific activities. In many

cases it represents just reorganizing some of the activities being currently provided.

Harlandale Independent School District--The total educational program for children who are destined for sheltered workshops can be facilitated when the classroom teacher allows students who are close to prevocation criteria to participate in some of the prevocation programs a few hours a week.

Dallas Regional Day School for the Deaf--Prevocational training, due to its unique features, is usually established in a separate room apart from the academic classroom (academic in this context means school work, as opposed to work jobs). The classroom teacher and the prevocational teacher should team plan for each individual student. In this respect, uniform programming and desired behaviors can be better effected. Supplemental language and math can be coordinated into the prevocational setting, and learning centers to complement prevocational tasks may be established in the academic classroom. In addition, fine and gross-motor problems impeding prevocational training for individual students may be remediated by the classroom teacher.

Callier Center--I.E.P. jointly. I.P.P. jointly.

Texas School for the Blind/Annex--

a. Joint meeting at the time educational plans are being written--input into each other's sections.

b. If possible, teacher can come to prevocation and work with child instead of hiring an entirely separate prevocational staff. The coordinator helps plan tasks and organizes the setting with input from the teacher.

c. Coordinator should visit the classroom on a regular basis.

d. Coordinator should work directly with children, not only in an administrative/consultant position.

e. The child's 24-hour day should be reviewed, with prevocational emphasis well integrated into total day.

f. Prevocational tasks can be an extension of classroom programming, many of same skills/concepts, but approach using tasks similar to those required in a workshop.

g. Child does not need to "graduate" into prevocational program. Classroom teaching and prevocational work skills can be taught simultaneously.

h. Make a joint effort to make child's world as unconfusing and consistent as possible.

6. What is being done in the area of leisure time activities for the deaf-blind, severely/profoundly handicapped student?

New York Institute for the Blind--At the Institute a wide variety of recreational options are available; however, many of the students at a sensory motor level do not use the facilities to maximum benefit. With many students "play" is actually being taught and in some cases conditioned. Because of their deficits they don't move naturally from one developmental level of play to another. For the higher functioning students group games and individual hobbies are being taught. A few students from this higher group are beginning to make leisure time choices when offered two or three options. Age-appropriate socialization skills are being encouraged.

Harlandale Independent School District--At the Harlandale Deaf/Blind Center, leisure-time activities are taught through the following curriculum:

a. Arts and crafts: painting, simple wood constructions, ceramics, copper enameling

b. Gardening

c. Swimming

d. Summer camp

e. Field trips: to the park, zoo, restaurants, San Antonio River

f. Over-night campouts

Dallas Regional Day School for the Deaf--All deaf multi-handicapped students, 12 years and older, are provided

with a prevocational and/or work activity center for two hours a day. During this two-hour period, students get one 30-minute break. This break time provides structured productive use of leisure-time activities. Socialization and communication with peers are stressed through structured play activities involving marble games, board games, puzzles, and cards, which are programmed by the classroom teachers. Various leasure-time activities and socialization strategies are planned according to individual student needs. In addition to 30-minute break time, all students ages 12 and over, as well as the younger deaf multihandicapped students, are taught hobbies and team sports during specified periods of the day.

Callier Center--Teaching these activities is an important component of most educational programs. This may include physical recreation, arts and crafts, and socialization.

Texas School for the Blind/Annex--After School Activities - South Central Regional Center, Woodward State School, December 1974. The Child Care Worker, Concepts, Tasks and Relationships. Adler, J., New York: Brunner/Mazel, 1976. Leisure Time Activities for the Deaf/Blind Child.

7. Comment on the debate between prevocation as life adjustment and prevocation as daily living skills.

New York Institute for the Blind--I'm not really sure I understand the question; however, here is an attempted response. Everything can be considered prevocational if one uses the type of argument that a person has to be toilet-trained to work. However, now I'm beginning to see refinement of daily living skills are more prevocational, but not the initial development of these skills. In other words, teaching a person socially acceptable ways to ask where the toilet is located could be considered prevocational. Work itself is a relative concept! The old adage of a child's work is his play is probably true. Concepts like unpaid family worker, full-time volunteer worker, etc., need to be explored as possible long-term options.

Harlandale Independent School District--I do not understand the fine distinction between "life adjustment" and "daily living skills."

Dallas Regional Day School for the Deaf--I don't think there is any debate on the subject of prevocation as

life adjustment or prevocation as daily living skills. I believe both life adjustment and daily living skills are very fundamental facets of prevocational training. Since prevocation involves the student in activities which will prepare him or her for responsible adulthood, primarily survival skills and the work experience, it is difficult to determine which is more appropriate, life adjustment or daily living skills. In reality, one cannot be well adjusted to life if the daily living skills have not been acquired. Following this line of thought, it seems feasible that life adjustment is merely a spiraling component of daily living skills. Life adjustment is an area of study that must be initiated early in a student's education and continued throughout an entire lifetime.

Callier Center--Prevocation is not synonomous with either life adjustment or daily living skills. These two activities or skills are basic and will be necessary regardless if the student enters a prevocation. One person's daily living skills is another person's life adjustment. This debate appears to be more on semantics rather than actualities.

Texas School for the Blind/Annex--When the subject of prevocational programming is discussed, many educational settings say "Everything we do is prevocational," or "Our students are not ready for that yet. We're still working on self-care skills." I object to the first statement because it implies the lack of thinking specifically about tasks oriented toward work--the kinds of skills and behaviors required of adults in productive settings. I object to the second statement because it sets a ceiling on how far children can develop by saying we can't work in one area until total independence is reached in another. Splintered development is the rule, rather than the exception with an SPH population. We need to develop strengths, not concentrate too much on weaknesses. Some students may have potential for performing repetitive, task analyzed jobs. They may be effective workers given an adapted environment with different kinds of expectations. Learning to interact with others, use of leisure time, learning a (l) to (r) orientation, fine-motor development, sequencing, tolerance for graded activity, self-control, and social skills are specific to vocational settings, and yet these skills can generalize to other situations in daily life. If a life adjustment approach includes teaching skills that can be generalized and optimally developing strengths and abilities, then it would seem to be most beneficial.

8. What do you see as the vocational future for deaf-blind adolescents and what can we do to be sure that this future is bright?

New York Institute for the Blind--First we have to be less rigid in what we define as work. Next, since deaf-blind persons are a relatively small or low-incidence group, we must realize the need to establish cooperative working relationships with programs and facilities serving other disability groups, because the population is so heterogeneous, it's really difficult for me to continue to see them as a distinct group.

Harlandale Independent School District--There are several areas of reform necessary to insure a bright and meaningful future for deaf/blind individuals. One area of reform would be to increase the emphasis of deaf/blind individual. Also, some "institutions" could be transformed into "extended living centers," where deaf/blind retardates could live in a semicustodial dormatory. Furthermore, businesses could be given a tax break for money paid for piece work contracted by sheltered workshops. This would encourage more employment for deaf/blind retardates. With the increased need for sheltered workshop employment, regional service centers could help fund the establishment of more sheltered workshops. Microcosmic communities could be created, consisting of extended living centers and workshops. It is possible that these microcosmic communities could be nearly self-supporting if businesses are encouraged to contract for services.

Dallas Regional Day School for the Deaf--As more emphasis is placed on prevocational and vocational training, the educational future of the deaf/blind adolescent is certain to continue to improve. As long as classroom teachers and prevocational coordinators view each student as an individual and attempt to establish realistic vocational plans, more deaf/blind students will be able to attain pride in some type of future employment. The kind of employment, whether it be in a sheltered workshop or in the competitive market, need not be stereotyped. Each deaf/blind student is an individual and each can attain a level of fulfillment unique only to him or her.

Callier Center--

a. Be more supportive to institutional programs for those unable to function in the community.

b. Provide options, i.e.,

Home employment
Sheltered housing and employment
Sympathetic employment and housing
Competitive employment
Combination of any above

c. Involve parents in all planning.

d. Involve rehabilitation people in all planning.

Texas School for the Blind/Annex--Most prevocational people, at least those working with young, SPH children, have been trying to train/teach their students skills so that they will be accepted into existing workshop systems. In many, many cases this is a very futile crusade. The majority of sheltered workshops, as they exist now, are inappropriate even if they were forced by law, parental pressure, etc. to take these students. This is not to say that SPH individuals do not have skills and abilities. They do, but they need modified programs, often with lower productivity and work tolerance requirements. Some alternatives to existing sheltered workshops may be:

a. Work activity centers that do not have to "break even" economically in terms of amount of work produced

b. Community-based programs for the multi-handicapped which have appropriate and satisfying activities, while at the same time encourage independence.

c. Modified sections of existing workshops, with different expectations for SPH individuals

d. Group homes - SPH individuals help maintain the home, have scheduled activities, and make trips into the community.

David Aaron
Harlandale Independent School
District
102 Genevieve Street
San Antonio, Texas 78214

Patricia English
UTD-Callier Center for
Communication Disorders
1966 Inwood Road
Dallas, Texas 75235

Frank Simpson
New York Institute for the
Education of the Blind
999 Pelham Parkway
Bronx, New York 10469

Arlein Stein
Dallas Regional Day School
for the Deaf
Spence Middle School
4001 Capital Street
Dallas, Texas 75204

Gretchen Stone
Texas School for the Blind,
Deaf-Blind Annex
3710 Cedar Street
Austin, Texas 78705

FUNCTIONAL LIVING SKILLS

TEACHING SELF-HELP SKILLS--
A DEVELOPMENTAL APPROACH

Peggy Russell

The occupational therapist's approach to self-help skills training is basically a developmental approach. As in all pediatric occupational therapy, evaluation and training are coordinated with the child's developmental status. Knowledge of developmental sequences is used to assess the functional level of the student and to prescribe individual training programs. The therapist chooses and supervises the child's activities, in this case self-help skills, to encourage progressive sequential development or to maintain the child's developmental status.

Although this paper deals primarily with self-help skills, it is impossible to separate self-help skills from other developmental skills. Capabilities and limitations in physical, social, motor, and emotional development must be taken into account. Each individual develops at different rates and in different directions, but there is a similarity in the sequencing of the mastery of skills. The understanding of normal patterns of development is basic to the comprehension of their relation to psychosocial or physical dysfunction.

Deaf-blind children exhibit a wide variety of handicaps. They also have a wide range of sensory-motor and cognitive capabilities. With a knowledge of normal development as a foundation, the occupational therapist focuses on handicapped individuals' capabilities in order to determine their level of functioning. While therapists must be aware of students' limitations, it is by noting their capabilities that therapists are able to make this assessment. Every child can do something in one or more developmental areas. Can he turn his head? Raise his arm? Sit independently? Chew and swallow? These are capabilities.

Although deaf-blind children vary greatly in their capabilities, there are three basic questions which apply to the planning of an individual program for any deaf-blind child.

1. Where is the child functioning now?

2. What is the next step on the developmental ladder?

3. What are the prerequisite skills necessary to begin training in a given area?

When the child's highest level of function in a skill area has been evaluated, it is necessary to know what skill is next in the developmental sequence. Familiarity with normal developmental sequences is essential to this process. Once this next step in the skill area has been identified, it is necessary to analyze the task to determine if the child has the prerequisite capabilities needed to begin training.

Let us take the case of a deaf-blind child who has the capability of finger-feeding but does not yet spoon-feed independently. In terms of normal development, independent spoon-feeding might be the next self-help training goal. In examining prerequisite skills it is found that the child possesses most of the capabilities necessary for spoon-feeding: good sitting balance and consistent hand-to-mouth coordination. However, one of the prerequisites for spoon-feeding is adequate grasp, and the child's grasp is inadequate for holding a regular spoon. At this point, trainers must make a judgment as to the next training step. They might choose to work on strengthening the child's grasp before attempting training in spoon-feeding. One alternative would be to adapt the spoon with a built-up handle or elastic strap so that training in independent feeding would not be delayed. Often in self-help skills training with the multihandicapped, a decision must be made regarding the use of adaptive equipment. The ultimate goal of maximum independent functioning should be kept in mind. Use adaptive equipment only when necessary to increase function. Often adaptive equipment only when necessary to increase function. Often adaptive equipment may be used at one point in training and be eliminated later. In the case of the child with inadequate grasp, a special spoon might be used for the initial training sessions. If the child's grasp improved through motor training, the transition to a regular spoon might be made.

Sensory-motor problems associated with the deaf-blind greatly influence self-help capabilities. What is the child's body concept? Can the child locate his mouth? What sort of head-control does he have? Hand-control? How is his sitting balance? A record of pretraining level of function will give an indication of where to begin training and will also show whether or not training methods are effective. For this reason it is essential that adequate baseline information be collected and recorded. Taking the time to observe, evaluate, and record upper limits of ability in the various developmental areas is the basis for planning a successful self-help program.

Once the skills to be taught have been identified, define them in a specific step-by-step fashion. A specific task should be divided and subdivided until subtasks are appropriate to the capabilities of the student being trained.

New tasks should always be extensions of previously mastered skills and each training session should begin with a task with which the child is familiar. Never begin a training session with a new step.

Whenever possible, practice self-help skills at the time when such activities would normally take place. Schedule the day so that time is given to work on taking off sweaters, coats, boots, etc., when the child comes to school or comes in from recess. Putting on outer garments, buttoning, and fastening can be worked on before going outside. Cleaning up is a self-help

skill and children should be given time and encouraged to clean up after themselves to the extent that their limitations allow. Even children in wheelchairs are often able to wipe their own desk or lap tray.

Positive reinforcement is vital to self-help skills training. Desired behavior should be reinforced, but all too often rewards are inappropriate and come at the wrong time. Reinforcers should be carefully chosen. Let the children pick their own. Take the time to observe children in various situations and note what captures their interest. Tactile and vestibular stimulation are often more rewarding to the deaf-blind child than food. It is vital that reinforcers directly follow desired behavior. Even a slight delay in presenting the reinforcer will result in reinforcement of inappropriate behavior. In one instance a trainer was working with a child on dressing skills and rewarding each step with a small piece of candy. The trainer pulled the polo-shirt over the child's head and arms. Then, holding the child's hands in place on the bottom of the shirt, he assisted the child in the final step of pulling the shirt-tail down. To reward this step, the trainer reached for the candy on a nearby table and, as he moved his hands, the child released the shirt. Nevertheless, the trainer gave the child the candy, thereby rewarding the child for letting go of the shirt! Once the shirt had been dropped it would have been better to skip the reinforcer. If a specific behavior is not rewarded immediately, do not reward it at all.

No matter how frustrating the session may have been, always end it by having the child perform a mastered task. Praise and positive reinforcement should end each session.

In working with the deaf-blind child on self-help skills, it is useful to begin each training session in the same way. A special rug or chair may be used as the training area when teaching dressing skills. Have the child sit in the same place at the table when working on eating skills. Placing a bib on the child serves as a cue that it is now time to eat. Tap the child on the bottom to indicate the child is to sit. (Initially you would move the child into sit fillowing the tap until he is able to do this independently on cue.) In dressing, rub the child's hands over the body-part which you will be dressing. For instance, prior to pulling on the child's sock, rub his hands over his foot to indicate he will be working on putting on his socks. Tapping the bottom of the foot might serve as the cue for putting on shoes until the child is able to do it. When moving the multihandicapped child's arms and legs, move them at the larger joints such as the elbows, knees, or hips, whenever possible. Pulling on a hand or foot will usually make the child pull in the opposite direction, especially if there is motor dysfunction.

Be aware of the child's position before attempting training. For feeding and toileting, the child's back should be supported with hips and knees flexed at 90° and feet flat on the floor. Many toilet-training programs have failed because the child was

left with feet dangling and inadequate support. Relaxation is vital to successful toilet-training. If the toilet seat gives inadequate support, the child will be tense. In this case, relaxation and toileting will in all probability occur when the child is returned to his own chair or mat.

Generally, successful self-help programs involved task analysis, behavior management, and an awareness of the sensory-motor capabilities of the individual within a developmental framework. Learning to take care of the basic needs of daily living is essential to human development, and the competent trainer uses self-help activities to enhance the child's self-image and communication skills and perceptual-motor and neuro-motor development. If the trainer will keep in mind the total child when training in self-help skills, training sessions will be meaningful and rewarding to both trainer and child.

Peggy Russell, O.T.R.
Region XX Education Service Center
1550 N. E. Loop 410
San Antonio, Texas 78209

THE PROBLEMS OF THE CHILD WITH CEREBRAL PALSY AND ITS RELATIONSHIP TO CLASSROOM LEARNING

Regi Haebig

Young children with cerebral palsy are now being serviced in the classroom as a result of innovative governmental legislation. The challenge has then been presented to educators to develop efficient and effective early treatment programs designed to enable the child to reach his or her highest level of intellectual functioning. Since effective learning is related to movement and active interaction with the environment, educators need to understand the importance of medical therapeutic treatment intervention during the educational process. They also need to have a basic understanding of the neurodevelopmental problems of the child with cerebral palsy.

Damage to the central nervous system creates a disruption in the development of postural tone, automatic reactions, and movement. The learning of movement is directly related to sensory experiences. Sensory input initiates and guides motor output. The normal child modifies primitive motor patterns and gradually adapts them into more complex functions such as walking, fine motor prehension, and understandable articulation skills.

The cerebral palsied child's abnormal postural reflexes interfere with normal development. His or her ability to combine stability with mobility and move against gravity is noticeably impaired. Spasticity (muscle tightness) creates too much stability and destroys the child's ability to move with ease. On the other end of the spectrum, the child with athetosis, generalized floppiness, or ataxia does not have enough stability needed for well-coordinated movements. In all cases, the cerebral palsied child does not have a functional balance between stability and mobility, causing a serious poverty of normal movement patterns. The damaged central nervous system reacts to sensory stimulation in a limited and stereotyped manner, with abnormal patterns of coordination and with abnormal postural tone. Consequently, the child cannot adequately integrate kinesthetic, tactile, auditory, and visual information in his or her immediate or classroom environment. This sensori-motor dysfunction often results in secondary intellectual retardation.

With a neurodevelopmental treatment philosophy, we hope to provide therapeutic control of sensory input and motor output, normalize general postural tone, and facilitate more normal movement patterns.

Affect of Cerebral Palsy on Feeding and Speech Skills

Abnormal postural tone, along with retained primitive reflexes, not only affect general movement patterns but also have a direct affect on the child's oral motor mechanisms which control feeding skills and subsequent speech production. The production of speech sounds requires a highly coordinated pattern of fine motor movements similar to those movements required for sucking, swallowing, biting, and chewing. Abnormal movements of the jaw, lips, and tongue produce feeding problems and ultimately causes deficits in speech production.

The smooth and coordinated function of the oral motor area during the feeding process is directly affected by the following:

1. Generalized abnormal postural tone and abnormal movement patterns.

2. Delayed or abnormal development of head control and poor stability of the neck and shoulder girdle.

3. Hypersensitivity to tactile, visual, and auditory stimulation.

4. Retention of primitive oral motor responses which are normal only when seen in the child under the age of four months. These include such responses as suckling, the phasic bite-release pattern, and a hyperactive gag.

5. Abnormal (pathological) oral motor responses that are not considered normal at any age have a considerable affect on the feeding process. Examples include:

   - Jaw thrust - abnormally strong downward extension of the lower jaw with greater force and tension than is seen in the full air opening of the young infant.

   - Tongue thrust - an abnormally forceful protrusion of the tongue in which the tongue often appears thick or bunched.

   - Tonic bite activity - an abnormally strong closure of the jaw upon stimulation of the teeth or gums.

   - Lip retraction - abnormally tight drawing of the lips back and on some children it is often mistaken for a smile.

6. Abnormal respiratory musculature affecting coordination of respiration with sucking and swallowing as well as respiration with phonation.

These examples of abnormalities seen in the oral mechanism of the cerebral palsied child are most often directly related to more generalized abnormal postural reactions seen in the rest of the body. For example, the jaw thrust is often seen as part of a generalized increased extensor tone. Retraction of the lips may be seen with neck and shoulder retraction. Tongue thrust is often related to head extension, and deviation of the jaw may be seen in the child with generalized asymmetry. Abnormal oral motor responses may increase as the child attempts to move within his or her environment or when the child becomes overly excited about environmental stimulation.

Prespeech and Feeding Guidelines

Assisting the cerebral palsied child to develop improved feeding patterns is of prime importance in the areas of (a) preparing the child for more precise oral movements necessary for clearly articulated speech, (b) improving the ease of physical management during snack and lunch periods, and (c) improving the child's nutritional intake since much food is lost during abnormal oral movements.

The most important aspect of any intervention program is a thorough and systematic assessment of the cerebral palsied child's abilities and disabilities (not only what the child cannot do, but why he or she cannot do it). What abnormal reactions are interfering with further development? What primitive patterns are present that can be built upon to facilitate higher-level development? This process of systematic assessment should be a constant and ongoing process.

The functioning of the oral motor mechanism has to be observed in relation to the whole body, since the cerebral palsied child usually reacts in more or less total movement patterns at any age. Consequently, the total child must be prepared for feeding by inhibiting abnormal muscle tone while at the same time facilitating a large variety of normal automatic movement experiences. This is achieved by using key points of control or those parts of the body where pathological reflex activity in the rest of the body can be controlled. By using key points of control, the child can begin to achieve a balance between stability and mobility, along with an increased variety of normal automatic motor patterns in preparation for functional skills.

Appropriate feeding positions can also inhibit abnormal postural tone or pathological reflex activity and at the same time facilitate normal isolated movements of the shoulders, arms, head, jaw, tongue, and lips. For example, children with generalized increased extensor tone can be positioned in a regular highchair with padding under the thighs so that the child's buttocks are lowered and the flexion in the hips and knees are increased to break up the pathological extensor pattern. Ties or an abduction post can be used to inhibit abnormal abduction or scissoring of the legs. Rolled towels can be placed behind the shoulders to bring the child's arms forward to avoid hyperextension of the shoulders and head and to facilitate a normal midline orientation during the feeding process.

Feeding positions are not limited to a highchair, but rather depend upon the child's age and neuromuscular needs. Feeding may best be carried out on an adult lap, in an infant seat, in a car seat, in an adapted chair, on a prone stander, or even in some cases with the child positioned in prone over a roll or wedge.

Hypersensitivity to visual stimulation and tactile stimulation both outside and inside the mouth will often increase feeding problems. The child may require a carefully graded presentation of food and food utensils. Oral tactile normalization results from early hand-to-mouth and toy-to-mouth experiences. Assisting the child grade his or her responses in this area will improve feeding skills and decrease drooling.

In children with feeding problems, head, trunk, and jaw control are essential. Most children require more flexion at the hips, which brings the trunk more forward during all aspects of feeding. Often the head is also slightly flexed forward in order to inhibit abnormal responses of head extension. Without good central control or good head and trunk control, oral motor movements cannot be coordinated.

Many significant modifications in oral motor coordination during feeding can be facilitated through changes in food textures, feeding utensils, and food presentation. Thickened foods and liquids often provide stimulation which allows the tongue and lips to respond with more normal, coordinated movements due to the increased textures. Using a spoon which properly fits within the child's mouth without touching the teeth or gums will help to reduce chances of eliciting abnormal tonic bite activity. Presentation of solids such as chicken strips or cookies to the sides of the mouth helps to reduce the possibility of the occurrence of jaw thrusting, tongue thrusting, or tonic bite activity, while stimulating more advanced movements of the tongue, jaw, and lips.

The child may still require more specific control of the oral mechanism usually provided through a procedure called jaw control, which assists in inhibiting tonic bite activity, jaw thrusting, and tongue thrusting, while facilitating more normal graded jaw movements, tongue movements, and functional lip activity. However, as with any treatment procedure implemented, the ultimate goal is to reduce the need for the use of that procedure in order to stimulate more normal coordinated oral motor movements during feeding and sound production.

Regi Haebig
Milwaukee Cerebral Palsy
Curative Workshop of Milwaukee
9001 West Watertown Plank Road
Milwaukee, Wisconsin 53226

HOW TO PLAN AND IMPLEMENT FEEDING PROGRAMS FOR MULTIHANDICAPPED CHILDREN

Patty Metcalf

Have you ever looked at your students and the system you are working within and asked yourself, "Where do I begin a feeding program and found not an answer but a feeling of being overwhelmed and frustrated. If so, you are not alone in your feelings, and most assuredly you are not alone in trying to determine where to begin.

Remember, first and foremost, that you are part of a team, a program whose purpose is to develop each child to his or her unique and fullest potential and that your position on the team is of great importance to the total functioning of it. You may be the teacher who works with the children and is the team leader, or you may be the consultant who is supplying essential information about a child's specific problem; perhaps you are the care giver, the parents or a staff member who is able to relate the important daily behaviors of the child. All of you as individuals must work together as a group to evaluate, plan and implement a child's feeding program. In order for your team to be effective, it must ask and answer these three questions: Where do we begin? Where are we going? and How are we going to get there? Answering these questions provides a system from which your team can function and reach its goal of developing each child to his or her fullest potential through appropriate learning experiences.

First, let's look at answers to the first question, Where do we begin? You and your team must begin by accurately defining the feeding problems of each child. You must understand what they are, why they exist, and for how long they have occurred. This information can be acquired by becoming familiar with your child's past history, which will provide information regarding the age the problems began, the medical care the child has received concerning his or her feeding problems and other needs, the remediation techniques tried and the method by which the child is usually fed. Second, you need to administer a developmental assessment tool such as the Callier Azusa Scale. This type of evaluation reveals the developmental patterns of growth in light of the child's handicaps and in comparison to normal growth and development. Proper interpretation of this assessment tool provides a clearer picture of your child's interrelated abilities and insight into the specific feeding problems. This information may

need to be supplemented by evaluations from specialists who may be a part of your team. Thus, the third method to identify your child's feeding problems is to use the following consultants: a physical therapist, an occupational therapist, a speech therapist, a nutritionist, a psychologist, and a social worker. Their findings should be used in conjunction with the information you acquired from the child's medical background.

In addition to reviewing your child's past history, doing developmental assessments, and securing evaluation from consultants, you may want to read educational materials that will further your understanding of your child, his or her feeding problems, and methods to remediate them. Two outstanding associations with ever-increasing educational materials are the American Association for the Education of the Severely/Profoundly Handicapped, 1600 West Armory Way, Garden View Suite, Seattle, Washington 98119; and the Council for Exceptional Children, 920 Association Drive, Reston, Virginia 22091. Membership in either is approximately $25 a year. A valuable source of information is the slide and audio presentation available from the C. Louis Mayer Children's Rehabilitation Institute, The University of Nebraska Medical Center, Omaha, Nebraska. It is entitled Care and Handling Module, "Beyond Survival," Parts I, II and III (approximately $150).

It is important to discover the cause(s) of your child's feeding problems: medical, oral pathology, environmental and behavioral. An evaluation of these areas for causative factors may not always pinpoint a direct cause. One may only be able to speculate the reason or reasons for a particular behavior, but speculation can provide a workable foundation for a successful feeding program. Some of the more common medical causes for feeding problems are:

Congestion:	Makes the child more likely to choke or to aspirate during the feeding experience. This is related to food allergies such as those connected to milk and milk products which can exaggerate or cause congestion problems.
Digestive:	Creates feeding problems in the area of nutrition when proper nutrition is not supplemented in some way.

need to be supplemented by evaluations from specialists who may be a part of your team. Thus, the third method to identify your child's feeding problems is to use the following consultants: a physical therapist, an occupational therapist, a speech therapist, a nutritionist, a psychologist, and a social worker. Their findings should be used in conjunction with the information you acquired from the child's medical background.

In addition to reviewing your child's past history, doing developmental assessments, and securing evaluation from consultants, you may want to read educational materials that will further your understanding of your child, his or her feeding problems, and methods to remediate them. Two outstanding associations with ever-increasing educational materials are the American Association for the Education of the Severely/Profoundly Handicapped, 1600 West Armory Way, Garden View Suite, Seattle, Washington 98119; and the Council for Exceptional Children, 920 Association Drive, Restion, Virginia 22091. Membership in either is approximately $25 a year. A valuable source of information is the slide and audio presentation available from the C. Louis Mayer Children's Rehabilitation Institute, The University of Nebraska Medical Center, Omaha, Nebraska. It is entitled Care and Handling Module, "Beyond Survival," Parts I, II and III (approximately $150).

It is important to discover the cause(s) of your child's feeding problems: medical, oral pathology, environmental and behavioral. An evaluation of these areas for causative factors may not always pinpoint a direct cause. One may only be able to speculate the reason or reasons for a particular behavior, but speculation can provide a workable foundation for a successful feeding program. Some of the more common medical causes for feeding problems are:

Congestion:	Makes the child more likely to choke or to aspirate during the feeding experience. This is related to food allergies such as those connected to milk and milk products which can exaggerate or cause congestion problems.
Digestive:	Creates feeding problems in the area of nutrition when proper nutrition is not supplemented in some way.

Breathing Abnormalities: Causes feeding problems that interfere with the child's abilities to acquire, process, and swallow liquids and solids.

Neuromuscular Disorders: Causes abnormal patterns of movement which interfere with the child's abilities to acquire and/or process liquids and solids. Those disorders that affect the entire body, usually affect the oral musculature in a similar way. Tables 1 and 2 provide a guide to the relationship between feeding problems and a child's overall motor coordination functions.

Primitive Reflexes: When these reflexes exist beyond the normal period, the child is unable to learn the next movement patterns until that reflex is diminished. The primitive patterns of movement that may cause a child's feeding problem are the rooting, suck-swallow, palmonental, asymmetrical tonic neck (ATNR), startle, bite, and gag reflexes.

The second area from which feeding problems may originate is oral pathology. Problems in this area are not always identifiable and may occur in relationship to problems in other areas. The following causes occur most often:

Dental: Whether caused by anatomical deviation, inadequate dental health, or medication, dental problems can affect a child's oral sensitivity and his or her abilities to process foods and liquids.

Anatomical Deviations: Problems in lip, tongue, and jaw movements and in swallowing abilities.

Oral Hypo/ Hypersensitivity: A severe obstacle in developing normal patterns of eating or drinking. Oral hypersensitivity can be caused by lack of or by too much stimulation around the mouth and produce a gaging response.

Oral Hypo/ Hypersensitivity: (Continued)	Oral hyposensitivity conditions usually exist in very passive infants or in those with severe hypotonis. It may be difficult to elicit a gag reflex and motor movement is quite limited in relationship to processing foods.

The third area from which feeding problems may originate is environmental factors. Inappropriate positioning and/or eating equipment may stimulate abnormal muscle tone in the feeding situation. The feeding atmosphere can produce or prolong inappropriate behaviors when its structure leads to unpleasant noise levels and inadequate supervision of individual feeding programs. Also, the child's diet must be evaluated to determine its affect on his or her abnormal behaviors and to determine whether it is meeting the child's nutritional needs for vitamins, minerals, and calories. The sensory appeal of the diet, along with the appropriateness of its qualities, should be investigated in light of the child's eating skills.

The fourth area from which feeding problems originate is the area of behavior. Behavior is defined as those problems the child has voluntary control over and which do not have a medical, oral pathological, or environmental cause. For example, the child may exhibit inappropriate feeding behaviors due to a history of over-concerned, over-reactive, and pressured supervision. This relationship in itself, whether at home or in a program, needs to be objectively evaluated for its causitive factors in the identified feeding problems.

The following evaluation form may be helpful to you in the identification of your students' feeding problems.

FEEDING EVALUATION

NAME: DATE:
D.O.B.: EXAMINER:
DIAGNOSIS:

1) Gross Motor Function (Rate: Good, Fair, Poor):
   - Head and Trunk Control in Sitting _____
   - Head Control on Prone Board _____
   - Position on Wedge _____
   - Hand Use for Self-Feeding _____

2) Tone:
   - Near Normal _____
   - Hypertonic - Predom. Extensor _____
   - Hypertonic - Predom. Flexor _____
   - Hypotonic _____
   - Symmetry _____

3) Tone of Oral Area:
   - Cheeks _____
   - Lips _____
   - Tongue _____

4) Oral Sensitivity:
   - Normal _____
   - Hypersensitive _____
   - Hyposensitive _____

5) Reflexes:
   - Rooting _____
   - Suck/Swallow _____
   - Bite/Chewing _____
   - Gag _____

6) Dental Development:
   - Bite _____
   - Teeth _____
   - Gums _____
   - Palate _____

7) Breathing:
   - Through nose or mouth _____
   - Rhythmical, coordinated _____
   - Congestion _____

8) Drooling _____

9) Describe Feeding Patterns in Terms of Action of Jaw, Lips, Tongue, & Food Types:
   - Drinking _____
   - Biting & Chewing _____
   - Spoon Feeding _____
   - Self-Feeding _____

Feeding Evaluation (Continued)

Summarize key problems

Make recommendations for positioning, feeding techniques, types of foods, and special equipment needed

Prepared by: Sue Sullivan, L.P.T.
Home for Crippled Children

Adapted From: H. Mueller Speech Evaluation

SS/pb
May, 1974

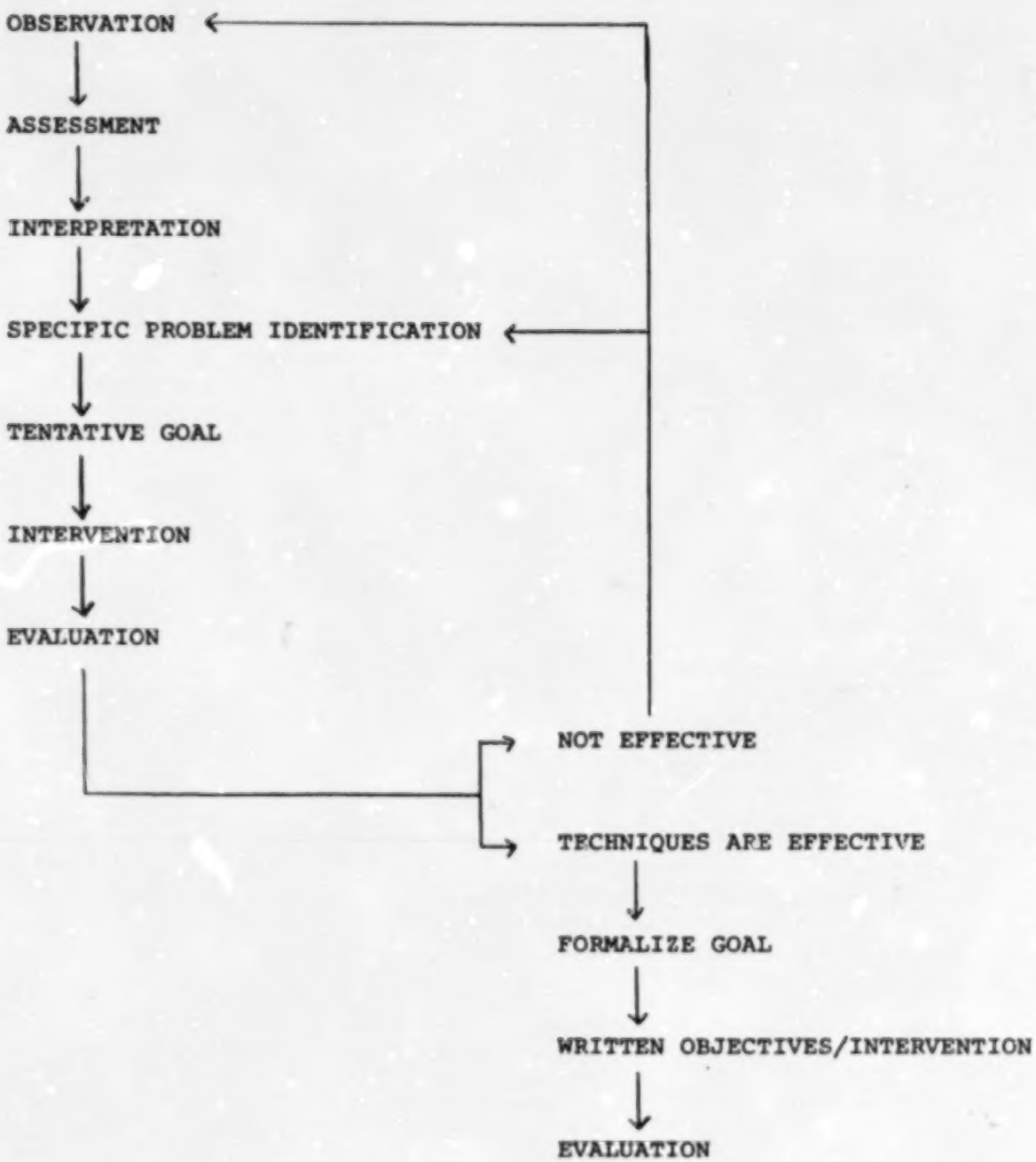
To summarize the answer to the first question, where do you begin?, your team must clearly define the feeding problems each child has in terms of what they are, why they are there, and for how long they have existed. Once this information has been determined, your team can answer the second question, where are you going?

The purpose of all educational programs is to develop each child to his or her fullest potential through appropriate learning experiences. Therefore, the answer to the second question is to plan individual goals that each child can obtain as he or she is progressing toward his or her fullest potential. When your team selects a goal or goals for a child with feeding problems, you must ask yourselves why the child should achieve those goals. The goals must be individually designed, reasonable, and achievable within the limits of the child's handicaps and environment. They should not be developed solely on the basis that the goal is the next skill on a developmental scale of normal feeding skills. While a developmental scale gives an outline of the normal sequence of skills, it is not in itself a list of goals that each child must accomplish. In order to select appropriate goals it is necessary to understand your child's present functioning level, and the pathological and/or behavioral factors that influence the development of effective feeding skills. It may be helpful to "put yourself inside the child" by doing, for yourself, what the child does to acquire and process the various foods he or she is eating.

Once your team has defined the feeding problems of an individual child and has selected appropriate goals, the goals must be arranged in sequence. Because changes should be made only at the speed that the child can handle them, you may only be able to work toward one or two goals at a time. Therefore, it is important to first work toward those goals that deal with medically and environmentally based problems. Thus, the digestive, dental, nutritional, and positioning problems can be improved, which may have a positive influence on the success the child will have in obtaining the goals that deal with the acquisition and processing of foods, as well as those that pertain to behavioral problems.

The answer to the third question, how are you going to get there?, deals with the means from which you develop a feeding program in order for a child to attain the goals your team has designed. These goals can be realized through constructive planning and by utilizing appropriate techniques and procedures that are based on proper identification and understanding of

FIGURE I


OBSERVATION
ASSESSMENT
INTERPRETATION
SPECIFIC PROBLEM IDENTIFICATION
TENTATIVE GOAL
INTERVENTION
EVALUATION
NOT EFFECTIVE
TECHNIQUES ARE EFFECTIVE
FORMALIZE GOAL
WRITTEN OBJECTIVES/INTERVENTION
EVALUATION

the child's feeding problem. But it does not stop here. You must also have an ongoing system to evaluate the effectiveness of your techniques and the accuracy of the identification of the feeding problems. Figure 1 shows one type of plan that can be used to develop a successful program.

For example, a child with little postural control caused by a neurological dysfunction has an identified feeding problem related to his position. Your tentative goal is to position him in an appropriate eating position. Your intervention is to use a seating device recommended by the physical therapist. This is tried, and there is an improvement in the child's posture for a short period of time. Because the intervention was effective, you can now formalize your goal and develop the written objectives dealing with the sequential steps needed for the child to reach the goal. A written objective must state the behavior expected by the child within the conditions of who, what, where, and when.

Before initiating techniques to change a child's ability to process various solids and liquids, you must be aware of the characteristics of the foods themselves and the effects they can have on the child's ability to function. Foods have six basic characteristics that influence a child's ability to accept and process particular solids or liquids: taste (sweet, sour, salty, bitter), smell (pleasant to unpleasant), temperature (cold to hot), appearance (color, size, shape), texture (soft to hard, smooth to rough), and consistency (wet to dry, thin to thick). Campbell (1976) gives examples of foods according to their difficulty factor in relationship to their textures and consistencies.

The techniques employed to change a child's ability to process solids and liquids will either inhibit abnormal behaviors or stimulate more normal ones. These techniques may be used by themselves or together. The basic ways to inhibit or stimulate responses due to abnormal motor patterns of movement are language directions, imitation, and sensory techniques such as tactile pressure, controlled stimulation, and physical manipulation. When initiating a particular technique it is important to have the advice of an expert in the field.

In conclusion, the success a child will have with a feeding program depends on your team's ability to properly identify the problems, develop reasonable goals, and initiate appropriate techniques and procedures in conjunction with an ongoing evaluating system.

The following pages outline the C. Louis Meyer slide series "Beyond Survival," Parts I, II, and III, shown with this presentation.

Beyond Survival: The Feeding Experience

I. Development of the Oral Mechanism and the Normal Stages of Feeding

A. Reflexes

1. Rooting Reflex - When the lips are touched, the head turns toward the source and the tongue extends in the direction of that touch.

2. Suck-Swallow Reflex - Medial lip closure allows infant to form a tight seal around the nipple. This suck-swallow pattern involves lip, jaw, and tongue movements, as well as swallowing and breathing.
   Extension - Tongue movement utilized for suck-swallow pattern. Primitive. Serves to move food from the front of the mouth to the back.

3. Palmomental Reflex - Present at 0-3 months. When infant's hand is touched, mouth opens, suck-swallow pattern begins.

B. Development

1. 4-5 months - Visual awareness of hands. Moves from generalized reaching to an intentional reach and grasp, along with bringing objects to the mouth (important step towards finger feeding.
   Elevation - Tongue movement utilized in removing food from the roof of the mouth. Facilitates babbling.
   Pre-Rotary Chewing - Mouth puckers, food is swallowed around inside mouth.

2. 6 months - Infants have acquired some teeth, are able to turn palm toward mouth and bite down on soft foods.

3. 9 months - Forefinger grasp emerges, allowing finger feeding.
   Lateralization - Tongue movement utilized to transfer food from one side of the mouth to the other.

4. 12 months - Two important skills:
   a. Child can hold chewable food and transfer it to the mouth.
   b. Child is drinking from a cup.

I. B. Development (Continued)

5. 15 months - Child deliberately spits out food.

6. 18 months - Child drinks skillfully and is able to hold spoon and fill it independently.

7. 24 months - Independent spoon feeding.

8. 32 months - Use of a straw.

9. 36 months - Child can pour from a pitcher.

10. 48 months - Child is able to eat with a fork.

C. Prerequisites for Independent Feeding - In addition to the normal progressions mentioned, there are six prerequisites necessary for independent feeding:

1. Head control.
2. Sitting balance.
3. Functional upper extremities.
4. Adequate body awareness.
5. Adequate control of jaw, lips, and tongue.
6. Adequate bite, chewing, sucking, and swallowing, as well as coughing.

II. Positioning the Child with Neuromuscular Handicaps

A. Common Interfering Problems

1. Due to this type of handicapping condition, the child is likely to involuntarily assume a position that is inappropriate for feeding. Therefore, if the child is unable to control his or her movements, it is the feeder's responsibility to position the child in an appropriate way to insure a successful feeding experience.

2. If the child lacks symmetry, proper positioning can assist in:

a. Adequate head and trunk control.
b. Proper sitting balance.

3. Problems interfering with proper positioning:
a. Asymmetry.
b. Total flexion patterns.
c. Total extension patterns.

II. A. Common Interfering Problems (Continued)
4. Review again need for:
a. Symmetry.
b. Balance of extension and flexion.

B. Breathing Abnormalities - Improper breathing patterns cause:
1. Frequent congestion.
2. Difficulty in the alternation of swallowing and breathing.
3. Depressed sternum.
4. Wide flaring ribs.
5. Distended abdomen.

It is important to obtain professional assistance for this type of child.

C. Lap Positions
1. Child on foam wedge propped between lap and table (facing feeder).
2. Child sitting in an inner tube, propped between lap and table (facing feeder).

D. Equipment
1. Child sitting in bean bag chair.
2. Child sitting in a Baby San chair.
3. Child sitting in Bobby Mac infant seat.
4. Wooden relaxation chair.
5. Hogg Stroller.
6. Mulholland Chair.
7. ENCOR positioning chair.
(Achievement of independent control should be everyone's goal. Therefore, be conscious not to over-position the child)
8. Commercially made prone board.
9. Hand-made prone board.
10. Barrel seat.
11. High chair with center post.
12. Adapted rocking chair.
13. Straight-backed chair with foot support.

III. Specific Problems of the Oral Mechanism

A. Reflexes
B. Abnormal reactions to food in the mouth.
C. Absence of lateral tongue movement.
D. Absence of lip closure.
E. Straw drinking.
F. Helpful hints.
G. Other problems.

TERMINOLOGY

Rooting Reflex

Suck-Swallow Reflex

Palmomental Reflex

Pincer Grasp

Tongue Lateralization

Tongue Elevation

Startle Reflex

Bite Reflex

Tongue Thrust

Head Thrust

Prerotary Chewing

Tongue Extension

****

Specific techniques for stimulating more normal oral patterns of movement and for inhibiting abnormal ones were demonstrated in Part III, but caution was given that these techniques should not be tried without the supervision of an occupational therapist or a related specialist.

Reference

Campbell, P. H. Problem-oriented approaches to feeding the handicapped child. Akron, OH: The Children's Hospital of Akron, 1976.

Suggested Readings

Holser-Buehler, P. Correction of infantile feeding habits. The American Journal of Occupational Therapy, 1973, 26 (6).

Morris, D. E. Program guidelines for children with feeding problems. Unpublished manuscript, 1974.

Morris, D. E. Selection of food and equipment for effective feeding therapy. Unpublished manuscript.

Stern, F. M. The reflex development of the infant. The American Journal of Occupational Therapy, 1971, 25 (3).

Sullivan, S. Feeding program for physically handicapped children. Unpublished manuscript, 1974.

Patty Metcalf
Teacher, Deaf-Blind
731 7th Avenue
Aberdeen, Washington 98520